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Volume 6 January-March Number 1

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FRANCE LOOKS FORWARD TO NINTH WORLD'S POULTRY CONGRESS

I was particularly happy to learn that the Council of the World's Poultry Science Association has decided that the 9th World's Poultry Congress will take place in Paris, in August 1951.

France is looking forward to the gathering of such a conference on her territory at a time when, in the whole world, men are striving to fight the food shortage. It is advisable, indeed, to face new needs which result not only from the considerable increase in the population, but also from the desirable higher standard of living of everyone.

This improvement of the quantity and quality of the products placed at everybody's disposal, as far as poultry products are concerned, formed the subject of numerous and important works submitted to the previous congresses, which is an effective contribution at establishing a better standard of living.

I have no doubt about the success that the great 1951 manifestation will obtain and in advance, I want to thank very much all the countries which will participate in it.

International cooperation, in this field of poultry science like in all the works whose main aim is to increase the material and moral wealth of humanity, must contribute in leading the world towards a better future.

With this hope, dear to all nations, I send in the name of the Government of the Republic my wishes for success to the 9th International Poultry Congress.

PIERRE PFLIMLIN
Minister of Agriculture of the Government
of the French Republic.

THE POULTRY INDUSTRY IN THE BENELUX COUNTRIES

F. LIEVENS

Belgian Ministry of Agriculture, Brussels, Belgium

In the general tendency toward a much tighter union of all Europe, Governmental Authorities are proceeding intensely with the preparations for the realization of Benelux.

The preunion stage, which is already in force, constitutes the last stop toward the final stage: complete economical union between Belgium, Holland and Luxembourg. When this aim is reached, custom barriers will not exist anymore between these three countries and therefore the exchange of goods will be completely free.

Numerous difficulties arise however on the practical field for the realization of this aim, which nevertheless became indispensable for the very existence of the concerned nations. These difficulties arise in all the sectors and are especially the result of differences in the economical and social structures of these countries.

We have a typical example in the field of "Benelux" aviculture. Here also, a series of problems will have to be solved first if one wants to avoid serious difficulties in the poultry industry of these countries, at the time of the complete application of the Benelux Economical Union.

These difficulties are principally the result of fundamental differences in the structures and the strict regulations in Holland on one hand, in Belgium and Luxembourg on the other hand.

For many indeed, Holland has extremely strict poultry regulation of which we find only few traces in Belgium and none in Luxembourg.

In order to understand better the nature of the difficulties which arise here, it is a good idea to compare first Belgium's aviculture with that of Holland; Luxembourg need not be considered because of the rather small importance of its poultry industry.

In 1928, Belgium poultry-stock counted some 24 million layers, Holland some 14 million. In Holland this figure remained around the 14 million mark, towards which Belgian poultry came down progressively in the last years before the war.

During the 1948/1949 breeding season, Holland had again a stock of 10 million layers and Belgium 12 million.

For the 1949/1950 breeding season, Holland has on hand a stock of 11 million layers and Belgium 14,720,000 layers.

The difference in the changes of the poultry-stock in the two countries comes from the fact that the feed allotment remained controlled in Holland, when it became completely free in Belgium beginning in 1947.

The average production of poultry shortly before the war, per hen and per year, was about 135 eggs in Belgium and 150 in Holland.

After the war, the average production was raised to 150 eggs per hen per year in Belgium and to 160 in Holland.

The hatching percentage in Belgium during the 1949 incubation season reached 68%; in Holland 65%.

In Belgium, 92% of the stock comes from hatcheries. In Holland, this percentage will be about the same.

Holland has a very strict regulation of poultry, aiming among other things at limiting the number of subjects to be raised. This regulation applies principally to the following points:

1. Each year an incubation season is determined outside of which it is forbidden to hatch eggs, with the exception of a few well specified cases. For 1948, this season was from January 1 to May 8. The aim is to obtain early hatching and, consequently, early laying. For the 1948 season, 20,725,000 eggs were put in incubators in Holland.

2. The grant of a breeding license.

For 1948, this license was only granted to the three following categories:

a. the non-poultry breeders who hatched exclusively for the needs of the farm and by means of their own incubators.

b. The breeders hatching for the renewal of their own stock in view of delivering chicks to the multiplication centers and, eventually to the non-breeder producers;

c. the properly so-called hatcheries with a capacity of at least 1,000 eggs.

3. The technical conditions imposed for the eggs put in incubators.

4. The number of chicks able to be hatched by hatcheries. This number is determined by means of a very complicated computation, which takes into account the different

elements of the Netherlands' agricultural policy, such as: food available, possibilities of exportation, etc . . .

For 1949, Holland intends to come back to the prewar stock, that is to say, to 14¾ million.

Absolutely no such regulation exists in Belgium. Anybody raises the number of chicks he wants and for which he obtains besides, feed at will.

On the other hand, the regulation is much more similar in the two countries in regard to the measures aiming at improving the quality of the products.

In the two countries, the public administration encourages the breeding of poultry by means of official recognition of breeding and multiplication centers as well as that of hatcheries, and by submitting these installations to a series of rather technical conditions.

In this respect, in 1949, Belgium owned 120 breeding centers with 151,000 animals. In Holland, there were about 173,000 subjects in the breeding centers. In regard to the multiplication centers, Belgium had accepted 2,345 of them with a stock of about 795,000 subjects. The multiplication centers have at the present time in Holland some 1,200,000 subjects. The capacity of incubators accepted in Holland reached about 14 million eggs in 1948, against 13,291,000 in Belgium.

In the two countries, the exportation of eggs is also submitted to a very strict regulation aiming at exporting only high quality products.

On the other hand, the interior commercial regulation of the two countries differs totally. It is hardly developed in Belgium and controlled in the smallest details in Holland. Let's point out finally that, in the two countries, the cross-breeding has developed considerably in the last years.

Such are the few elements which enable one to compare the aviculture in the two partner countries which are the most important of the Benelux.

One can arrive at the conclusion that it will be necessary to straighten up certain factors of the poultry industry in the two countries before reaching complete application of the "Benelux". Contacts are taking place constantly between the official services of the two countries, to reach this aim as soon as possible.

TODAY'S POULTRY FEEDS

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Today's poultry feeds are vastly different from those of ten years ago, and if one may use the past as a guide, there will be many more changes in the next few years. The feed industry has made excellent use of the expanding knowledge of poultry nutrition by making better and more efficient feeds which in turn have enabled the poultrymen to do a more efficient and economical production job. These developments have occurred in every phase of nutrition—energy content, proteins and amino acids, vitamins, and minerals, and more is yet to come. In order to use the new information in any phase to best advantage, the others must keep pace, for after all a barrel will only hold water up to the height of its shortest stave. Most widely discussed of these recent advances is the work on energy, vitamin B_{12} and the animal protein factor (A.P.F.), and amino acids.

During the late 1930's and early 1940's, our knowledge of vitamin, mineral and amino acid requirements outstripped our knowledge of the energy requirements of growing birds and the net available energy content of the feed became a limiting factor. Using the wealth of data on energy metabolism compiled by Dr. G. S. Fraps of Texas and the discovery that the water-soluble vitamin, nicotinic acid, counteracted the undesirable effects formerly produced by diets high in corn, the Connecticut workers, Drs. Scott, Matterson and Singsen formulated a practical, high-corn ration. This type of a feed, containing nearly 70% yellow corn supports very rapid growth and a high rate of feed efficiency. It precipitated a sudden and wide-spread interest in the energy content of poultry feeds and demonstrated that more efficient poultry feeds could be formulated. Actually the Connecticut Broiler Ration should have been called a "high-efficiency" ration rather than a high-energy ration, as a high level of energy alone would be disastrous and the chicks fed such a ration would die rather than grow. The most outstandingly different characteristic of this ration was its high net energy content, but it also contained high levels of fish meal, meat scraps, liver meal, fermentation products as a source of the vitamin B complex, and two crystalline vitamins, choline chloride and nictotinic acid. As Dr. H. R. Bird wrote recently (Poultry Tribune, June, 1949),

"Energy isn't the whole story." Every part of the ration, protein, vitamins, minerals, must be formulated to support the potential value of a high-energy ration if the final product is to be a real high efficiency ration.

The relatively high levels (8% each) of fish meal and meat scraps contained in the original Connecticut Broiler Ration, unquestionably contributed to the high feed efficiency obtained with it. However, the steady reduction of animal protein supplements for feeding purposes in relation to total livestock numbers, has forced the use of increasing amounts of protein supplements of vegetable origin, particularly soy bean oil meal. The rations containing high levels of soy bean meal (18 to 22 per cent) are cheaper in initial cost, but are also less efficient. Part of our current research work is centered around this problem of making high soy bean meal rations as efficient as the original Connecticut Broiler Ration. Limited amounts of high grade wheat middlings and ground barley are being used successfully in these experiments. Still another factor that may play an important role in future high-efficiency rations is the use of pure amino acids such as methionine and lysine. Their use in practical starting rations is being investigated.

Closely associated with the protein problem is the animal protein factor (A.P.F.) of which vitamin B_{12} is a large part. This complex was provided in the early high-energy rations by liver meal and fish meal. The supply of liver meal soon proved to be inadequate, so fish solubles and then commercial concentrates of A.P.F. were tested. Both products can successfully replace liver meal so far as A.P.F. is concerned. The possible value of the amino acids contributed by the liver meal must be considered with the rest of the protein problem. The coming year will undoubtedly see a big increase in the use of A.P.F. concentrates, but it should be remembered that A.P.F. is a vitamin and it will not correct a poor balance of amino acids.

Much has been said concerning the relative merits of specific formulae published by various college research groups, and whether or not they can be changed. Many highly successful variations have been made and more will be forthcoming. So long as the basic principles are understood and the final formula provides all the nutrients necessary to support rapid growth on a high-efficiency ration, the results will be satisfactory. If any part of the nutritive requirements are slighted, the feed will no longer be a high-efficiency ration and will perform no better than a 1949 streamlined car with three or four spark plugs missing.

BALUT—A DUCK-EGG DELICACY*

HUBERT MANESS
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A duck-egg delicacy, unknown to the rest of the world, has given rise to a flourishing duck industry in the Philippines. Especially preferred by the Tagalog people in and around Manila, the delicacy is known by the Tagalog word, "balut." It is, in brief, unhatched duckling. As popular in Manila as "hot dogs" in the United States, millions of these eggs are sold by peddlers every year along the streets of the city.

In the preparation of balut, a duck egg is kept in an incubator until it is almost ready to hatch. It is then removed and hard-boiled in the shell.

Nobody knows how long the Tagalogs have eaten this exotic food, but the custom may be centuries old since the Philippine duck industry began hundreds of years ago, probably with the arrival of the Chinese traders. The Chinese, in order to get protection from typhoons, established their early settlements along the shores of Laguna de Bay, a fresh-water lake drained by the Pasig River, which in turn runs through the modern city of Manila.

One of their early villages was later renamed Pateros (Duck Raisers) by the Spaniards because of the large number of ducks found there at the time of the Spanish conquest. The raising of egg-laying ducks is still the principal business of Pateros. Although there are about 400,000 ducks in the village flocks, they do not produce enough eggs to meet the demand for balut, and millions of eggs are imported annually.

INCUBATION METHOD

Duck eggs are hatched in home-made bamboo incubators shaped like a barrel. (Fig. 1.) The incubators are placed, close together, in a large, specially constructed incubating room. The floor of the room is covered with about 2 feet of rice hulls, which help to absorb the humidity.

The incubators are in reality large woven bamboo barrels about 3 feet high and 2 feet in diameter, fitted to hold 10 round trays, one placed on top of the other. The trays also are made from woven bamboo and hold from 100 to 120 eggs each, depending upon the size of the eggs. Thus one hatching barrel holds from 1,000 to 1,200 eggs. The rest of the equipment is also homemade and simple. It consists of rice

* This article originally appeared in *Foreign Agriculture* Vol XIV, No. 1, January, 1950.

Fig. 1. Duck eggs are incubated in home-made bamboo barrels. Eggs for balut are removed just before they are ready to hatch.

hulls, abaca mesh bags, a copper kettle, and coconut hulls or charcoal, which is used as fuel. In preparing the incubator, rice hulls are heated in the copper kettle until they are very hot and dry. They are then put into abaca bags. One of these bags is loosely fitted into the bottom of the barrel, then an egg tray goes on top of that, followed by another bag and a tray until the barrel is full. Over the top is placed a bag of heated unpolished rice, because unpolished rice holds heat longer than the hulls. Finally the assembled incubator is topped with a large, heavy abaca cloth.

Three times every 24 hours the egg trays are removed and the eggs are turned by hand. During turning, they are sprinkled with water if atmospheric conditions warrant it. The rice bags are replaced with hot ones whenever necessary. During the height of the hot season, they are generally changed only once a day, in early morning when the temperature usually drops.

Because of their long experience the men operating the hatchery do not use a thermometer to test the temperature of the eggs; instead, they place them against their cheek or eyelid. The eggs are candled after 8 days, and the infertile ones are removed. Such eggs are then boiled until hard and sold under the name of "penoi," which is considered inferior to "balut."

BALUT PREPARATION AND DISTRIBUTION

The remaining eggs are left in the incubator for an additional 10 days, after which they are removed, boiled until hard, and marketed as balut.

These eggs are sold by peddlers along all the principle streets of Manila. They are kept warm in small well-covered baskets. To the Filipinos who eat balut, it takes the place of meat since the embryo is well-formed and has a meat flavor. The hard-boiled yoke is considered very tasty because of its cooked-blood flavor, and the juice is drunk with great gusto. When the Tagalogs eat balut, they crack the egg at one end,

drink the juice, and then pick out the content with their fingers.

DUCK RAISING

This duck industry is made possible and economical by the fresh-water lake, Laguna de Bay, which contains almost unlimited amounts of snails and other aquatic duck food. Laguna de Bay, just southeast of Manila, is 25 miles long and 21 miles wide and covers an area of about 350 square miles. Its outlet is the 12-mile-long Pasig River. One of the most picturesque and interesting sights in the world is the water front with the thousands of duck runs, thickly placed along the shores. Each run is filled with hundreds of ducks of various colors—white, brown, black, and combinations. Each run is separated from the other by only a few feet of low bamboo fence. (Fig. 2.)

Since the primary purpose of keeping ducks is for egg production, a remarkable nonbroody strain has been developed. It is a small duck similar to the American mallard. Many of the duck raisers claim that their flocks average from 150 to 180 eggs annually and that individual records of 250 eggs are common. The ducks lay the year round with only slight fluctuations between the rainy and dry seasons.

The owners state that the ducks seldom fly out or stray from their pens, but, if they do, they always return to the place where they were raised. At night the ducks are put into bamboo enclosures adjoining the run and are released after they have laid their eggs the next morning. The floors of the roosting pens are covered with rice hulls, and the ducks drop their eggs during the early hours of morning. The main diet of the ducks consists of snails, which are collect-

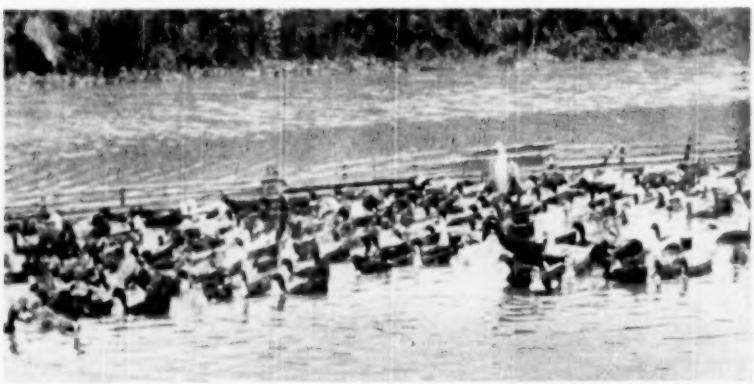

Fig. 2. Flock of ducks at Pateros, the center of the balut industry.

ed around the edges of the lake and given to them in generous amounts. Young ducks are fed rice in addition.

The eggs kept for replacing the breeding stock are hatched in the same way as for balut, except that they are incubated 28 to 30 days. The ducklings are generally hatched during August or September so as to mature in the coolest season of the year. According to several breeders, it is not uncommon to get a hatch of from 85 to 95 percent.

The ducklings are separated soon after hatching, and only the female ducks are raised by the big producers, the drakes being sold to small home raisers. For a long time I was puzzled to see, in the public markets of Manila, hundreds of ducklings being offered for sale at 15 cents apiece side by side with fresh duck eggs costing 25 to 30 cents each. The mystery was solved when I discovered that the ducklings were all drakes, the "ugly ducklings" of the balut industry.

When the ducks are 2 years old, they are generally sold for meat. From these old ducks the Tagalogs prepare the delectable dish, "dinogog." For this the birds are dressed and cut up into small pieces and steamed with small slices of green papaya, which makes them tender. Then various vegetables and herbs are added, mainly fresh ginger root, green onions, and cabbage leaves. Many countries have dishes similar to dinogog, but none has anything quite like balut.

LUXEMBOURG POULTRY SITUATION

Luxembourg produced about 40 million eggs in 1949, or about the same number as before the war. Chicken numbers, however, are estimated at 400,000 which is only about 77 percent of prewar. The rise in output per hen is attributed to improved stock and more extensive use of breeds emphasizing egg production.

Imports of eggs totaled only approximately 12 million eggs in 1949 since it was difficult to obtain imports at prices as low as the official Luxembourg ceiling price. Imports of about 400 metric tons of poultry were made in 1949.

The 1950 production of eggs is expected to be about the same as 1949 while imports of 14 million eggs are anticipated. These goals should provide a per capita consumption comparable to prewar.

Egg prices in Luxembourg are currently fixed at 72 cents per dozen.—Foreign Crops and Markets, U.S. Dept. Agr.

THE POULTRY INDUSTRY IN BELGIUM

F. LIEVENS
Belgian Ministry of Agriculture, Brussels, Belgium

THE POULTRY AND EGG BUSINESS BEFORE 1940-1945

According to the general census which was taken in 1910, Belgium owned at that time about 13 million layers.

During the First World War, Belgian poultry stocks were reduced to about 4 million layers.

Shortly after, Belgian aviculture made amazing strides, especially encouraged by the following elements:

1. Improvement in the standard of life and increased needs resulting from it;

2. Favorable geographical situation of Belgium, working capacity of her dense population with ample family manpower, especially in the Flemish section of the country, improvements in the rational feeding, and finally importation of highly selected breeds on a large scale.

In 1928, Belgium owned 24 million layers when the disastrous economical crisis was in sight. In 1931, this stock was reduced to about 20 million layers; in 1935, 18 million; in 1939, approximately 14 million.

The fluctuations of egg importations and exportations during that period give a rather clear picture of this change.

The fluctuations of importations and exportations from 1920 to 1938 are shown in the accompanying table:

	IMPORTATION		EXPORTATIONS	
Year	No. of eggs	Value in Francs	No. of eggs	Value in Francs
1913	212,677,609	[illegible],701,704	134,548,139	55,353,104
1920	6,256,999	3,806,033	725,594	496,046
1921	52,958,954	23,734,130	1,649,672	902,570
1922	114,071,927	36,877,668	14,166,646	5,542,956
1923	65,495,756	25,583,113	64,384,796	39,523,494
1924	32,270,463	16,472,122	116,040,863	96,082,208
1925	34,811,601	18,334,587	215,987,553	132,334,273
1926	8,591,412	6,183,332	405,552,038	309,055,298
1927	7,273,000	9,149,000	483,119,000	399,737,000
1928	16,982,000	9,098,000	684,993,000	572,541,000
1929	17,848,000	15,219,000	712,856,000	659,092,000
1930	20,714,000	15,107,000	515,204,000	417,935,000
1931	8,563,000	5,448,000	573,342,000	389,487,000
1932	7,208,000	3,466,000	622,321,000	285,637,000
1933	23,981,000	7,100,000	330,824,000	144,070,000
1934	11,665,000	3,981,000	238,154,000	100,727,000
1935	8,227,000	5,185,000	185,721,000	89,106,000
1936	13,316,000	6,796,000	198,903,000	106,996,000
1937	5,259,000	2,912,000	210,188,000	109,308,000
1938	3,819,000	2,961,600	136,556,000	80,814,000

Until 1922, the Belgian trade balance was therefore showing a surplus of importation over exportation ranging from

approximately 50 million to about 100 million eggs. Beginning in 1923 this surplus was reabsorbed and in 1924 Belgium became an egg exporter, exportation surplus reaching nearly 695 million eggs in 1929.

From 1930 and on, serious difficulties arose in Belgian poultry culture. Importing countries were either closing their borders, or were creating obstacles to Belgian egg exportation.

The situation was improving slightly until the year 1933, when England following the Ottawa conference, changed her commercial policy by favoring openly the Dominions at the expense of the other trading countries.

We have to accept the fact that Belgian aviculture did not have, at that time, a structure adapted to the practical necessities of a commercial poultry industry; on the whole, only specialized breeding farms possessing healthy and carefully selected poultry-stock were holding up.

During the last years before the Second World War, in that labyrinth of impediments and economical or other barriers, which the European continent had become, the vigilance and tenacity of the Belgian egg exporters were nevertheless successful in exporting a surplus of some 200 million eggs.

STRUCTURE OF BELGIAN AVICULTURE BEFORE THE LAST WAR

The organization of Belgian aviculture was chiefly characterized before the Second World War by the existence of a very large number of small poultry clubs and associations. All these societies, were in principle affiliated with nine provincial federations of poultry societies, each one working in a province.

The delegates of the latter formed the National Federation of Belgian poultry societies (F.N.S.A.)

In 1938, this Federation claimed about 1,300 affiliated societies. It was the only poultry federation recognized by the Government.

The great disadvantage of this structure was that the provincial federations, which formed the above-mentioned national federation, being formed by delegates of the local associations, did not reflect the exact Belgian poultry situation. All these societies were, in short, only the expression of a local and often individual amateurism.

On the other hand, the real Belgian poultry industry was hardly represented in all this organization.

From the "sporting" point of view, this situation presented incontestable advantages, but from the "practical aviculture" point of view, the inconveniences were just as great and much more important for the Belgian poultry economy.

This does not exclude that the said F.N.S.A. had real merits. In consideration of the meager means at its disposal, it performed a priceless work. The breeding of Belgian poultry was officially given to this organization.

In this domain, the F.N.S.A. sought to realize these aims by:

a. The creation of breeding centers whose role was to determine the quality of productiveness in the different breeds raised in Belgium.

There was one breeding center in each province.

b. The creation of hatching centers whose role was to provide at a moderate cost hatching eggs, chicks, pullets and young cocks to the members of the societies affiliated with the provincial federations.

c. The organization of the national egg-laying competition, whose purpose is to check frequently the breeding and hatching work. The first national egg-laying competition was held from 1921 to 1928, at Pâturages, and the second one from 1929 to the present time at Roulers. This competition is an excellent test for improved subjects. It enables one to detect the best progenies, with controlled high productions, to establish the cost and the food consumption of the different breeds, to judge the importance of production during certain periods of the year and to make practical experiments on different questions which arise in aviculture.

d. The fight against pullorum and diphtheria,

e. National and international poultry shows,

f. Courses and lectures,

g. National and international congresses.

In the frame of this structure, Belgian aviculture carried on with the breeding stock, following in its great principles, the instructions given by the Ministry of Belgian Agriculture, through its Breeding Service.

From the breeding point of view, this situation on the whole presented the following disadvantages:

a. The breeding business was not sufficiently emphasized. Poultrymen producing eggs for consumption only were not in a position to make a clear distinction between those really producing breeding stocks and other producers.

b. The origin, and hence, the value of the selected egg and chick, were not sufficiently guaranteed.

c. The incubator owners practically ruled the market of selected chicks. A bitter competition reigned between the different incubator owners.

During the German occupation, Belgian poultry was again reduced to about 4 million layers. As for all animal species, the Ministry of Agriculture's Breeding Services tried to preserve the most valuable specimens of the poultry-stock. They took advantage of the organized rationing to select breedings worthy to be used as breeding stocks and able to establish the basis for the reconstitution of poultry-stock after the war. The result of this policy was, that after the war, practically all the Belgian hens descended directly or indirectly from select breedings.

BELGIAN AVICULTURE AFTER THE SECOND WORLD WAR

Profiting by the experience acquired in the period described above, the Belgian Ministry of Agriculture began shortly after the liberation, a complete reorganization of its utility and exhibition poultry.

This reorganization was materialized in two legal texts, notably the Regent's decree of March 11, 1946 on the improvement of poultry and rabbit breeds and his ministerial execution decree also of March 11, 1946. Shortly after, especially on June 3, 1947, a ministerial decree granted important subsidies from the State, for the improvement of poultry and rabbit stocks.

The important principles of this organization are as follows:

1. *Autonomy in the organization of fancy and utility poultry*

The organization of the utility or commercial poultry culture on the one hand, and that of the fancy or breed on the other hand, were clearly separated.

The purpose of this, is to give to practical aviculture the possibility to have an organization able to take care immediately of all necessities which might arise, to make proper suggestions to competent authorities without unnecessary delays.

For this purpose, the regulation leads to group all poultry breeders exploiting, more or less commercially, poultry breeding. All these poultry breeders are directly grouped into provincial societies of utility poultry breeders which care

for everything concerning poultry breeding and farming and also the evaluation of poultry products.

These provincial societies send two delegates to the National Federation of provincial societies of utility poultry breeders.

On their side, the societies more or less in charge of the "sporting" aviculture are grouped into provincial federations of poultry breed societies, which also send two delegates each to constitute the National Federation of poultry breed societies.

2. *Breeding and multiplication centers.*

The new regulation stipulates the official acceptance of breeding and multiplication centers.

According to this regulation, nobody can sell poultry products anymore under the name of selected products, if the poultry breeder's business does not satisfy conditions carefully regulated to protect breeding.

At the time of writing this article, the Ministry of Agriculture had officially recognized 125 breeding centers, 2,330 multiplication centers and 549 hatcheries.

The breeding control in these centers is given to provincial societies of ultility poultry breeders and their National Federation, under the supervision of the Ministry of Agriculture's zootechnic advisers.

3. *Hatcheries.*

In Belgium, about 85% of the eggs are incubated in commercial hatcheries which, because of that, have a huge influence over the breeding of all the national poultry.

Thus, the regulation stipulates that for the hatcheries with a capacity of more than 1,000 eggs, eggs put in incubation must all come from approved breeding and multiplication centers.

Belgian Aviculture has thus on hand an "armature" which ought to enable it to meet new situations created after the Second World War.

The results obtained until now prove, that so equipped, the Belgian poultry industry will be able to stand the competition of any country, in regard to the supply of carefully selected and very highly qualified poultry products.

GEORGIA'S YOUNGEST CASH CROP — BROILERS

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From a few thousand broilers raised in the late twenties to 400,000 in 1934, and 33,025,000 in 1948. That is the story in brief of the expansion in production of one of the major farm enterprises in the north central part of Georgia's agriculture program.

To most people who are not familiar with the basic factors responsible for the development and growth of the broiler industry, the story is fascinating and almost unbelievable. Commercial broiler production, however, is just as sound in the farm program of the north Georgia farmer as cotton with the cotton farmer, peanuts with the peanut grower or any other farm enterprise that has been established in any other section of the state.

The factors fundamentally responsible for the success of the broiler development have been: (1) A need for more income, (2) Capital or Credit, (3) Markets, (4) Quality chicks, (5) Good feed, (6) Production knowledge, (7) Family labor, (8) Organized production.

The feed manufacturer, the feed dealer, and the hatcheryman have cooperated to give the grower a good chick, good feed and credit to produce a good broiler. These same agencies have furnished, through service men, the knowledge to the grower to do the job.

Processing plants and truckers of live poultry to outside areas have been the markets. The feed dealer and hatcheryman explored the market.

All members of the family usually have a part in the care of the chicks until they are ready for the market.

Concentration of production has been a big factor in building markets. Without this concentration the industry would not be what it is today.

THE AREA GEOGRAPHICALLY AND AGRICULTURALLY

The topography of the land in North Georgia is rolling to mountainous. The soil is red or sandy red clay, with a high percent of the top soil having washed away due to continuous row cropping. Forty or fifty acres is the average tillable land per farm with a large portion of this being sub-marginal. As a result, these small farms with sub-marginal land have had

low yields per acre. Low yields mean low income. Low income means a poor standard of living. A poor standard of living for the farmer is depressing to agriculture and business in general.

This was the situation twenty years ago.

MORE INCOME WITH A MINIMUM OF INVESTMENT NEEDED

The North Georgia farmer had little capital to expand or change his system of farming. It required all of his meager earnings from cotton to barely exist from one crop year to the next. It was impossible for him to accumulate capital or establish security with the banks so that he might borrow money to change his system of farming.

Roads were poor and almost impassable at times. A mule and wagon were the common means of transportation. This presented a problem in marketing any quantity of production.

The farmer needed more income. This was possible only through: (1) Credit for production, (2) A cash crop other than cotton, (3) A market for his production, (4) Small investment in production facilities.

TO THE RESCUE

Realizing the farmer's plight, some of the civic-minded individuals in the Gainesville area became interested. They suggested to a few farmers that production of broilers in their off season (winter) be tried. The farmer immediately responded: "I have no house in which to grow them. I have no money to buy feed and I can't get credit. And even if I could finance the production of the broilers, where would I sell them?"

But these interested individuals expected just such a response and were ready for it.

Their reply was: "We will help you get started. You build a house or convert an old building that will offer protection. We will get the chicks for you. We will furnish the feed and deliver it to your door. We will find a market and pick up the chickens at your farm when they are ready to sell. When the broilers are sold, we will deduct the cost of the feed and the cost of the baby chicks and any other miscellaneous items needed during the growing period. You get the balance. You, Mr. Farmer, furnish the house and the labor."

And so, on the above basis *the broiler industry in North Georgia was born.*

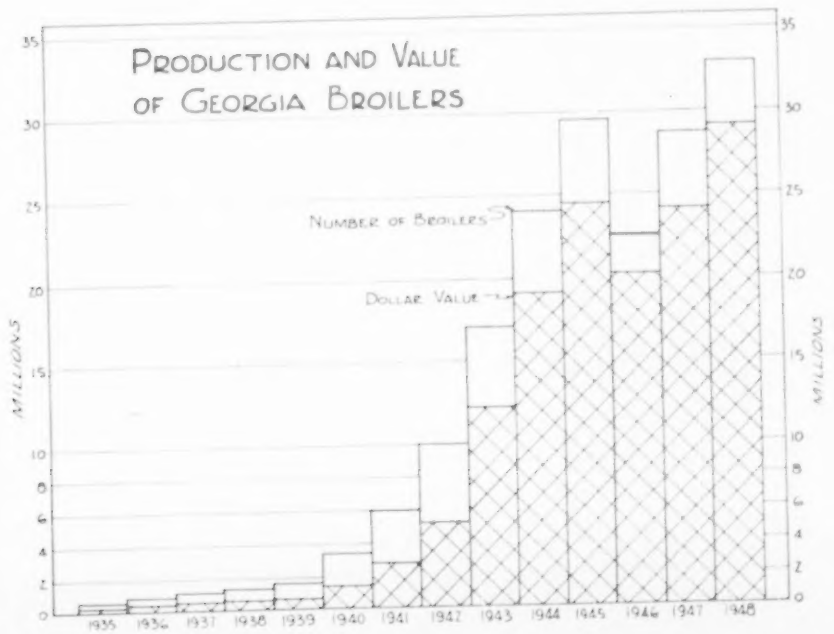
GROWTH AND VALUE OF THE INDUSTRY

Like any successful business, the broiler industry has been built from the ground. It has a sound foundation, therefore, it will withstand a lot of hard jolts.

To emphasize the importance of the industry, it is necessary to compare the income from broilers with that of other enterprises on the Georgia farm. The table below brings this out for the year 1948.

Enterprise	Cash Receipts*	Gross Receipts**
Poultry		
Broilers	$ 29,108,000	$ 29,108,000
Chickens	5,963,000	14,152,000
Eggs	16,550,000	26,285,000
Turkeys	1,196,000	1,322,000
Total	$ 52,817,000	$ 70,867,000
Livestock and Dairying		
Hogs	$ 46,353,000	$ 81,251,000
Cattle and Calves	37,582,000	37,807,000
Dairy Products	31,450,000	70,864,000
Total	$115,385,000	$189,922,000
Crops		
Cotton Lint	$118,940,000	
Peanuts	84,668,000	
Tobacco	47,644,000	

*Value of Products Sold
**Value of Products Sold and Consumed at Home



THE PRODUCTION UNIT

In the early stages of development the average production unit had a capacity of from 500 to 1000 chicks. By starting with these small units, the investment in housing was small and the risk taken by the creditor was not so great. The farmer usually netted from $40.00 to $100.00 per 1000, which at the time was good.

As time went on, markets developed and experience was gained—there was room for expansion. Expansion was not in the size of unit then but in the number of broods grown. Instead of growing out one crop, two were produced.

Success stories travel fast—more farmers saw the possibilities. The desire of more farmers to grow broilers created a demand for more financing. As a result more dealers were established by the large feed manufacturers and more farmers were given an opportunity to grow broilers.

After a few years, some of the original growers began to expand. They usually replaced the original house with one larger and more substantial. New growers usually followed the practices in the community in which they lived.

Today, according to a survey of 100 farms in the area, the unit capacity is still small but much larger than originally. A breakdown in capacity of 100 farms studied follows:

Size of Unit (Chicks)	Percent of Total
999 or less	1
1000 — 1499	15
1500 — 1999	7
2000 — 2499	17
2500 — 2999	11
3000 — 3999	15
4000 — 4999	10
5000 — 6999	13
7000 — 9999	8
10,000 and above	3

Although this is not a large sample, it does indicate the trend.

An average of 3 broods are now produced annually as compared with one in the beginning.

THE HOUSES

Rough lumber has been used almost entirely for construction of the broiler house. Some are constructed with skinned poles as the framing and "slabs" for siding. Rolled composition

roofing is used mostly. Building paper is used over the side walls to make the house tight for the winter months. This keeps construction costs down.

Better and more attractive houses are being built by a few growers. New materials, such as concrete blocks and aluminum, are coming into the picture. This indicates more permanency.

Ninety-four (94) percent of the houses have dirt floors—the balance either wood or concrete.

Seventy-four (74) percent have a gable roof. Twenty-five (25) percent are shed roof, while one (1) percent are old buildings converted, with no particular roof type. The trend has been and still is definitely toward the gable roof.

Automatic waterers are in eighty-two (82) percent of the houses. Eighteen (18) percent still use founts.

Seventy-two (72) percent of the growers have one broiler house, twenty-two (22) percent have two houses, four (4) percent have three and two (2) percent have four houses.

BROODER MANAGEMENT

Wood burning brooders were first used. Many of them were homemade, and of many designs. The initial cost was low, however, and no cash outlay was necessary for fuel. Expanded production required too much time for cutting wood, therefore, coal brooders replaced wood brooders almost entirely. Some growers are now using oil brooders and the trend seems to be more to oil. Of 100 farms surveyed, eighteen (18) percent were using wood, twenty-two (22) percent oil and sixty (60) coal. Electric brooders are not used for commercial broiler growth in the North Georgia area. Gas brooders are now in some of the larger units.

The number of chicks brooded per stove varies from 350 to more than 1200. The figures below give the number of chicks per stove and the percentage of growers in each class for the 100 farms surveyed.

Number per stove	Percent growers
499 or less	2
500 — 649	9
650 — 749	11
750 — 949	28
950 — 1199	38
1200 and above	12

Mortality varies with growers depending upon quality of the chicks, management, etc. The average, however, is about

8 percent. During mid-winter the figure is much higher than at any other time, due primarily to over-crowding and insufficient heat.

The floor space allowed per chick varies from .5 sq. ft. in winter to .75 sq. ft. in summer—the average being .65 sq. ft. for all growers.

Only one age chicks are usually brooded on the same floor.

SOURCE OF CHICKS

Fifteen years ago practically all chicks grown were shipped into the state. Today the area hatches eighty (80) percent of the total requirements. The remainder of chicks come from outside the state.

Competition has encouraged quality in local chicks. Local hatcherymen are aware of the factors necessary to produce quality and are meeting this competition. At first pullorum disease in local chicks caused heavy losses. It is not a serious problem now.

BREEDS

A cross involving Rhode Island Red females and Barred Rock males was the most popular to begin with.

The grower soon learned that the cross grew faster and produced a pound of meat on less feed than any other breed or cross. Meat strains of New Hampshires soon began to gain in popularity and become available. As dressing plants were established and more broilers were dressed locally, the demand for New Hampshires increased. Good meat strains of New Hampshires grew just as rapidly and economically on the average as the crosses and required less labor for dressing. A light plumaged meat chicken with a Columbian Color Pattern is now produced to a small extent.

FEEDS AND FEEDING

In the early days of commercial broiler production, "Starting and Growing Mashes" were used. This was the best available at the time.

It was not until about 1936 that a broiler mash was manufactured and used by a few growers. Within two or three years all of the broilers produced were fed a broiler mash straight through to market time. This feed was formulated to give a faster rate of growth—containing higher levels of protein and the vitamin concentrates.

Just before World War II pellets came into the picture as a supplementary feed. Since the war, pellets have gained in popularity.

Supplementary feeding of vitamin and mineral concentrates is practiced by some growers. This, however, is not a general practice and usually gives results only when the feed is deficient to the extent that maximum growth is not attained, or in some cases where mismanagement and diseased conditions exist.

Low fibre feeds that will produce a pound of meat with less feed is now on the market. With a good chicken and good management, it requires about 3 pounds of feed or less to produce a pound of gain. The average is 3½ however.

MARKETS THE ANSWER

Whatever may be said about the factors responsible for the success of the Broiler Industry in North Georgia, there is no doubt about *ready markets* being the most important. This not only applies in the case of broilers, but with any commodity produced.

Local *processing plants* and *live truck haulers* to outside areas are the markets.

Prior to 1938 there were few broilers dressed in the area because there were no processing plants. There are now dressing facilities for more than 100,000 head per day. Two of the plants are packaging and freezing a portion of their out-put. Most of the dressed poultry moves by truck and express, fresh-dressed and ice-packed.

Approximately 75 percent of the total production goes through the dressing plants. The remainder is hauled alive by large trailer trucks. The North Georgia broiler is widely distributed in the south—movement to other sections is small, also seasonal.

Many of the trucks are operated by small processors in distant cities that bring the broilers in, process them and sell locally. Other trucks are operated by the dealer that does the financing and hauls to the distant points—usually the larger cities.

A number of processing plants have established regular routes within a 50 or 100 mile radius of the plant and are selling chickens to small town stores that have never before handled chickens except in late summer when the yard fryer was ready to sell. Thousands of people in Georgia are now eating fried chicken the year round whereas a few years ago they had it for maybe two months in the year—during summer. These small towns are all over the south and offer excellent markets—even Georgia markets haven't yet been anything like fully developed.

PRODUCTION OF HATCHING EGGS

It was not until 1936 that local hatching egg flocks were established. This was primarily experimental and involved just a few hundred layers by one hatcheryman. After a year or so other dealers in feed and chicks followed the practice. They learned that a good locally produced chick was better than a shipped chick. For the 1948-49 season there are a quarter-million layers that supplies half the eggs needed to meet the demand for chicks. There will be a half-million supplying 80 percent of the chicks for 1949. This phase of the broiler industry is growing in importance.

Many hatcherymen are putting out fall hatched chicks to be grown for summer layers. This will give them hatching eggs as a source of chicks at a time when they are ordinarily scarce.

WHAT BROILERS HAVE MEANT TO THE AREA

It is rather hard to evaluate accurately just what this new farm enterprise has meant to the farm people and business in general. One needs to visit and talk with the people in the area to fully appreciate its worth.

Probably the greatest long-time value is coming from the utilization of the poultry manure on the land and the increased yields resulting. The income from broilers has given the farmer an opportunity to build up a lot of the sub-marginal land and at the same time raise his standard of living. Pastures are being developed that will encourage more livestock.

More homes have been remodeled and painted; there are more new homes and service buildings; more modern conveniences in the home to make life easier for the women folks.

There are more cars, trucks and tractors owned and operated by the farmer—this has called for better roads.

Schools have been improved—more children are going to school and for a longer period.

The industry has supplied jobs to hundreds of people off the farm. This means more money for more people.

Banks have more money on deposit than ever before—due in no small part to the poultry industry in the community.

Above all things, however, the broiler industry has been responsible for a healthier and happier people.

THE FUTURE

Community minded people who are unselfish and have a sincere interest in their community will not only work to keep broiler production where it is today, but will make efforts to improve and expand it.

There are potential markets that haven't been touched. Better and more attractive packaging will create higher consumption as will strict inspection of local dressing plants. Federal inspection and grading must come.

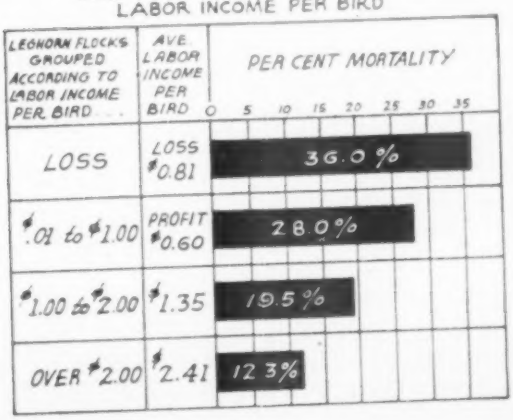
HIGH LAYING FLOCK MORTALITY VERY COSTLY

High mortality in the laying flock is not always an indication of inefficient management because sometimes, in spite of the best care and attention given a flock, losses from mortality may be excessive due to some disease epidemic. Some epidemics occur through no fault of the flockowner. By and large, however, well managed flocks usually suffer less mortality than poorly managed flocks.

The effect that laying flock mortality may have on the loss or profit per bird per year is shown in data obtained from Ohio farm flocks. When the laying-flock mortality did not exceed 12.3 percent, the average profit for the laying year was $2.41 per bird. Flocks in which mortality averaged 19.5 percent made an average profit of $1.35 per bird. Flocks in which the mortality was 36 percent showed a loss of 81 cents per bird. The difference in returns between the first and last groups of flocks was $3.22 per bird.

All flockowners always should realize that losses from mortality are both a direct and indirect nature. Direct losses include the value of birds that die and the value of the feed and labor involved in rearing them up to the time of death. Indirect losses result from lowered egg production among many of the birds that survive the attacks of parasites and disease. Efficient management in controlling losses from disease and other causes is one of the best paying practices for all flockowners. High mortality in the laying flock is very expensive, the more so when feed prices are high and other costs of production are high. —(Morely A. Jull)

The RELATION OF MORTALITY to LABOR INCOME PER BIRD



POULTRY KEEPING IN NORTHERN IRELAND

J. G. RHYNEHART
Ministry of Agriculture, Belfast, Northern Ireland

Although Northern Ireland is smaller in area than Yorkshire, it has more farms than Scotland. This at once suggests that the farms must be small, and anyone who has crossed the Irish Sea and approached Belfast Lough or Larne Harbour in daylight will not fail to have noticed the "patchwork quilt" appearance of the countryside—the small fields of the small farms. About eight of every ten farms in Northern Ireland are less than 50 acres in size and the small peasant farmer is the backbone of agriculture throughout the country. As a result of the various Land Acts every farmer is now the owner of his holding and is quite independent of a landlord—a one-time bone of contention that has now ceased to exist.

The farms, being small, make it necessary for their owners to engage in a concentrated type of farming in order to obtain a livelihood, and poultry and pigs loom large in the activities on the average farm, being suitable for the peculiar conditions which exist. Prior to the late war the great increase in pig keeping was one of the chief features of development, but the scarcity of purchased feeding stuffs had its inevitable effect on that industry in Northern Ireland as in other parts of the United Kingdom.

The poultry industry, on the other hand, which also had made big strides prior to 1939, was able to weather the storm of food scarcity and has actually continued to expand during the war years and since. The number of poultry on farms, as shown by the June census in each year, has increased from less than ten millions in 1939 to over twenty-two millions in 1949. Thus, the poultry population more than doubled in ten years. There are over 80,000 poultry-keepers in Northern Ireland and the value of the poultry industry is greater than that of any other agricultural industry and, indeed, of any other single industry of any kind. The value of the poultry industry for the year ending 31st May, 1948, was £17,381,000, of which £13,286,000 was in respect of eggs and £4,095,000 in respect of dead poultry. We are now supplying about one-fifth of the eggs needed to provide the egg ration for Great Britain.

How was it possible for our poultry keepers to increase the poultry population, in view of the shortage of purchased foods, and why did the increase take place?

The chief reason was that poultry keeping is carried on as part of the activities of the farm. Every farmer keeps poultry and we have no specialist poultry keepers who depend largely or solely on poultry for their livelihood. We have long since reached the stage, now being advocated and encouraged in Great Britain, where the farmer regards the poultry flock as a valuable asset in his farming activities. Every farmer also grows oats and potatoes, which are the two principal crops, and the Tillage Orders, instituted as a war-time measure for increasing food production at home, had the effect of stepping up, to a marked extent, the area under these crops and consequently the tonnage of oats and potatoes produced. Under the Tillage Orders every farmer was required to have under tillage crops a specified proportion of the arable land on his holding, but he was free to grow the crops he chose on that area and, naturally, he grew those which he considered were the most profitable. The greatest increases took place in oats, dredge corn, potatoes and flax. Sales of oats from farm to farm were always permitted, and this automatically helped the poultry industry, but the conditions applicable to sales of potatoes, wheat and barley were the same as in Great Britain.

I must emphasize at this stage the fact that Northern Ireland's farming, including poultry keeping, is based on sales of commodities to Great Britain. The principal cash crops grown are potatoes and flax and the principal livestock products sold are eggs, poultry, beef, bacon, mutton, wool and milk. Over 80 per cent of the income of farmers is from the sale of stock and stock products. Oats, the main cereal crop, are used to feed the stock and are marketed through the finished product, apart from surpluses sold by one farmer to another for stock feeding and for seed, but oat growers generally have found that the sale of the oats through the hen in the form of eggs is more remunerative than is the disposal of them in bags to poultry keepers or others at the controlled price. But "black market" prices are not unknown.

When the rationing of feeding stuffs was inaugurated the poultry keepers turned to home-produced oats and potatoes to supplement the meagre allowance of rationed foods and the diet of the poultry consisted largely of oats and potatoes. This is the secret of the increase in poultry, despite food rationing. Our food rationing scheme is different from that in Great Britain. The allowance is based on the number of eligible stock on the farm at 1st June each year as certified by the Policeman who collects the information. The ration al-

lowed to poultry has never been more than ½ oz. per bird per day, and at present it is five-sixteenths of an ounce plus 12½ per cent. The owners of Accredited Farms got an additional issue of 10½ lb. per bird, while entrants at the Laying Test who were not accredited have also got this allowance in past years but will not necessarily get it in future as I shall explain later. A farmer may elect to take the allowance for his poultry in the form of protein foods, which he usually does and uses these to balance the home-grown oats and potatoes. In certain districts there may also be supplies of separated milk available during the summer months and these are used largely for poultry feeding. I should mention that milk production has developed very markedly in all districts in recent years, largely because of the attractive prices paid for the milk, but also because of the introduction of a scheme whereby the same net price is paid in all parts of the country, irrespective of the cost of collection and transport to depots or processing centers.

Poultry Improvement Schemes. The Government has always fostered and encouraged the poultry industry. Schemes for the improvement of the stock have been in operation for many years and marketing regulations, which have the backing of Acts of Parliament, have revolutionized the standards of quality of eggs and of the grading and packing of them. Prior to the war eggs were purchased by weight and on a quality basis and the prices to the producer for top quality eggs were based on the prices obtained by the shippers during the previous week in cross-Channel markets. These were incentives to the producer to offer only good sized and good quality eggs as poor quality depressed the price obtained by the packer and this in turn depressed the price the producer obtained the following week.

Since the Ministry of Food took over the purchase of eggs purchases are made by count but we have always continued the quality basis and make deductions in respect of eggs which are soiled or which are stale. Despite the fact that we produce a surplus of eggs and ship millions to Great Britain, we have the same egg rationing scheme as exists there and are otherwise subject to the controls imposed by the Ministry of Food.

Prior to the inauguration of the Accredited Farms Scheme about fourteen years ago, a Poultry Breeding Stations Scheme was the basis of stock improvement work. The owners of these Stations were subsidized to enable them to sell hatch-

ing eggs from specially selected pure bred stock at a cheap price to poultry keepers in the neighborhood. These Stations were instrumental in popularizing pure bred stock of prolific strains and they were the foundation of successful commercial egg production throughout the country. They have now been largely superseded by the Accredited Farms which are not subsidized but which have more freedom as regards crossing and the prices charged for hatching eggs than the holders of Stations enjoyed. But these Stations left their mark on the industry and were instrumental in raising the standard of the stock kept on general farms throughout all districts to a marked degree and also the productive capacity of the stock. It would be difficult today to find a farm on which the birds kept are not of a pure breed.

The number of Accredited Farms has increased steadily from 33 in 1935 to 930 in 1949, and there is evidence that a further addition will take place in the coming season.

In future the Accredited Farms will be graded into categories designated A, B and C, as follows:

Grade A. Farms on which trapnesting and pedigree breeding are being done and advantage taken of the facilities provided at the Progeny Testing and Cockerel Testing Station to have samples of the stock tested. The stock must be of a high standard as regards both type and production, and considered to be capable of effecting an improvement in the stock on the farms in the other two Grades. In general, farms which are specializing in one breed only are regarded as being most suitable for this grade and, because of the amount of work necessary in connection with recording, pedigreeing and progeny testing, farms having more than two breeds are least likely to be able to qualify. Unless all the breeds on a farm reach the standard for A grade none will be so graded.

Grade B. Farms on which a start has been made with pedigree breeding and recording with a view to qualifying later for A grade. Good results in the ordinary section of the Laying Test will be an advantage. The stock must be of a standard that is calculated to improve the stock on Grade C farms. Where more than one breed is kept each breed must be of Grade B standard or better; if not, the farm will be graded C.

Grade C. Farms not eligible for B grade and whose owners are primarily concerned with the production of eggs for sale to hatcheries.

Owners of Grade A and Grade B farms are expected to give priority to orders from private customers and, in the case of Grade A farms, it is hoped that the bulk of the eggs from pure bred matings will be distributed to the owners of Grade B and Grade C farms.

To give an idea of the size of the accredited farms in Northern Ireland, the average number of birds mated for pure bred chicks on the 930 farms this season was 124, and the average number mated for first crosses was 92 before 1st March and 144 after that date.

The comparative popularity of the different breeds may be gleaned from the following figures which are the percentage of farms on which the breeds stated were kept:

Rhode Island Red	67.1%
White Leghorn	36.9%
Light Sussex	8.5%
White Wyandotte	6.0%
Black Leghorn	5.5%
Brown Leghorn	4.2%
Exchequer Leghorn	4.1%
Ancona	2.8%

This shows that the Rhode Island Red is by far the most popular breed, with the White Leghorn a good second and the other breeds far behind. The White Leghorn is increasing rapidly while the White Wyandotte, once the most popular breed with us, is declining quickly.

The Accredited Hatcheries Scheme has been in operation for about five years and thirteen hatcheries are accredited this year. The total incubator capacity of these thirteen is 1,583,600 eggs which is 2½ times the capacity of all the non-accredited hatcheries. This scheme is voluntary but legislation is contemplated which will require all hatcheries to be licensed before they can engage in the hatching and distribution of chicks. The conditions governing licensing will be based on those of accreditation.

Laying Trials. A Laying Trial has been run at Stormont each year since Northern Ireland came into being in 1922. It was necessary to enlarge the plant on three occasions to provide accommodation for the demand that developed, and houses and runs for about 160 6-pullet teams have been available for some years. This was considered to be sufficient to meet the normal needs of breeders but we had to refuse over 100 pens for the present test. However, this is not an indication that 260 pens are necessary but a reflection of the use

that is being made of the test to obtain additional feeding stuffs. A rule made a few years ago enabled those who entered a pen at the test, but who were not accredited, to qualify for a bonus issue of feeding stuffs as if they were accredited, and this has been abused in some cases. It was assumed that anybody entering a pen in the test was interested in breeding but, unfortunately, this was not always the case and we received an increasing number of entries of doubtful quality which depressed the average production over the entire test. Thus, while the production in recent tests of the top pens was as satisfactory as formerly, the average tended to get lower. The rules have now been framed to eliminate this undesirable development and to give priority to the entries from genuine breeders. Thus, entries eligible for the Progeny Testing Section will get first priority while second priority will be given to entries which, although not eligible for progeny testing, are of birds whose breeding and the records of their ancestry are known. In future it will not be possible to get a bonus issue of food in respect of an entry that does not come into either of these two categories.

We have found that insistence on a type standard for the main awards, including the Championship Cup, has done much to improve the quality of the stock on the farms of those who participate each year in the Tests. This Cup is the most coveted of the awards and the pen that wins it is that placed first by the Judge for type amongst those pens which qualify for first-class certificates by laying at least 1,080 scoring eggs. It is clear that good type and good production are not antagonistic to each other. There have been many instances where pens placed high for type have also been very high producers, and many pens of poorish type have also been poor producers.

We are not satisfied, however, that the Test as it has been organized up to the present, is achieving its main purpose or is of the maximum benefit to the poultry industry. I have already referred to the decline in the average production and indicated one reason at least for this, namely, the desire to qualify for additional food. But, apart from this, there has not been sufficient emphasis placed on family records and too much on the performance of individual pullets. The soundness of the copper ring principle is open to doubt in this regard. Many breeders made up pens with birds from two, three or more matings and used the Test to give them, as they thought, some information on the value of the different sires. There

were comparatively few pens of full sisters and, therefore, little scope for appraising the value of sires on a sound genetical basis. The idea that a high producing bird would breed prepotent cockerels, even though her sisters were poor layers, was prevalent but experience gained at a high cost showed that this system was so uncertain as to be practically useless as a general guide.

The objects of the new Progeny Testing Section of the Test are, therefore, to encourage and foster an interest in breeding on a family basis and to obtain information regarding the prepotency of the sires used to breed these families. The birds sent to the Test by a breeder will be a sample of the flock and the testing of them offcially will be a check on the trapnesting, pedigreeing and progeny testing done on his own farm. Thus, a breeder who has an entry eligible for the Progeny Testing Section at Stormont will be one who is engaging in recording and progeny testing himself and it is such breeders whose farms will find a place in the A category of Accredited Farms. This indicates the linking up of the Accredited Farms with the Test at Stormont and shows that the new Test is an attempt to provide a better service than the existing Test can do to assist the breeders in their own efforts to raise the standard of their stock. In short, the new Progeny Test is an attempt to extend the usefulness of the Laying Test beyond telling a breeder the number of eggs each of his test pullets laid in forty-eight weeks—it aims to tell him if the cockerel which bred them is worth using in future.

Cockerel Testing Station. Arrangements have been made to establish a Cockerel Testing Station to provide facilities for the Progeny Testing of cockerels additional to those provided by the new Laying Test organization already described. This station, which is a new innovation in the testing of potential breeding stock and the first of its kind, so far as is known, will be quite distinct from the Laying Test and be run on a new plant to be erected on ground adjoining the existing Laying Test site. It will be managed by the Laying Test staff.

The chief difference between this Station and the Progeny Testing Section of the Laying Test is that the pullets to be used to test their sire will be bred and reared at the Station instead of on breeders' farms, and only the cockerels to be tested will be sent to the Station. Accordingly, a number of breeding pens consisting of recorded hens will be established at the Station, the cockerels for testing mated with

these, the eggs hatched, the pullet chicks reared and a representative sample of the progeny from each mating retained for recording for forty-eight weeks.

In due course a Register will be established in which will be entered the particulars of the pedigrees and the breeding records of the sires tested in this and the Progeny Section of the Laying Test, which have been proved to be prepotent.

Finally, let me make it clear that I have not attempted to do more than indicate the lines on which we intend to start these new schemes. I realize that there will be many points on which only experience can decide how best they should be dealt with in order to provide the maximum information and the greatest assistance to the breeder. It is our hope, however, that we are embarking on work of importance and value to poultry breeders and that it will be the means of raising the status and usefulness of official testing to a higher plane than heretofore.

SOME FACTS ABOUT THE POULTRY INDUSTRY IN THE UNITED STATES

Fifteen years ago the average hen produced 118 eggs annually; today she is producing 160.

Last year it was estimated we consumed 388 eggs, just 100 more than we did 15 years ago.

Ten years ago it was considered an excellent result to produce a 3 pound chicken in 12 weeks with 11 pounds of feed. Today we consider a practical goal is a 4 pound chicken in 12 weeks with 12 pounds of feed. (W. C. Termohlen)

CONSUMPTION OF EGGS AND POULTRY IN CANADA

The per capita consumption of eggs by the civilian population of Canada in 1940 was 244 eggs; in 1948 it was 282 eggs.

In 1948 the per capita consumption of poultry meat was as follows: 15.88 pounds of hens and chickens; 2.84 pounds of turkey; 0.32 pounds of geese; and 0.17 pounds of duck. (Foreign Agriculture, Dec. 1, 1949)

REVIEW OF POULTRY PUBLICATIONS

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GENETICS

FINNE, IVAR and VIKE, NILS. *(Statens Smabrukslaererskole, Norway).* A NEW SUBLETHAL GENE IN CHICKEN. *Tidsskrift for det norske landbruk*, No. 1, 1949.

A hereditary *atresia isthmi* was found in White Leghorns. The chicks develop normally but at sexual maturity the hens can not lay because their oviduct is interrupted at the isthmus. Because the eggs can not pass through the oviduct they escape into the abdominal cavity and cause inflammation of the peritoneum of the hens; therefore the hens generally die at 5 or 6 months of age. Often the interruption of the oviduct is accompanied by an isthmus between the vagina and the cloaca. The defects seemed to be heredity-linked to one another. One male which had a gene for atresia isthmi showed a distinct interruption on the right sperm duct (vas deferens) behind the testis. This character having a sublethal effect in the females seems to depend on a simple dominant gene. Because those hens having interrupted oviduct do not produce any offspring, it is impossible to prove if the gene for atresia isthmi is sex-linked or autosomal. The defect has no lethal effect in the males. As only one of the sperm ducts is interrupted the males are able to spread this character in the flocks. Because the genitals are attacked as well in males as in females the gene also can be considered as a sterility character with sublethal effect in the hens.—*Nils Olsson.*

GERICKE, A. M. SEX DETERMINATION IN CHICKS. *Farming in South Africa 22:* 253: 391-398, 1947.

Various methods of sex determination are discussed such as—Sex-linkage, down colour in Barred Plymouth Rocks, rapid feather growth, wingspot, Japanese or Cloaca method and autosexing. Results are given of an autosexing variety which was bred in South Africa from several breeds and varieties of fowls.—*A. M. Gericke*

GERICKE, A. M. THE AUSTRALORP BREED OF FOWLS. *Farming in South Africa 24:* 262: 33, 1948.

The origin, breed characteristics and productive qualities of the Australorp are described.

The White Australorp originated in South Africa as a mutation from the black variety. This new variety was admitted to the standard in April 1939. These attractive dual purpose white birds should become popular egg producers and table birds in Africa.

Since 1934 experiments were conducted in the breeding of the Buff Australorp. Considerable progress has been made and this new variety was officially recognized by the South African Poultry Association in April 1949. This is a most attractive bird.—*A. M. Gericke.*

GERRY, R. W. *(U. of Maine, Orono)*, and D. H. MISHLER. *(Purdue U., Lafayette, Ind.)* SEXING BARRED ROCK CHICKS. *Poultry Sci. 28:* 479-485. Illus. 1949.—A sex identification study was made of 940 Barred Plymouth Rock chicks of doubtful sex selected from approx.

9500, which were used in 16 nutrition expts. over a period of 18 mos. The sex of such chicks can be detd. more accurately by using the head markings alone than by using the leg markings alone. By making use of both head and leg markings and by classifying these markings into various types, the authors were able to improve the accuracy of sexing the doubtful chicks from about 70 to 86%. In some nutrition expts. it is desirable and convenient to divide male and female chicks evenly in the exptl. lots.—*D. H. Mishler.* (Biological Abstracts)

HAYS, F. A. *(Agric. Expt. Sta., Amherst, Mass.)* PHENOTYPES AND GENOTYPIC SELECTION OF BREEDING FEMALES. *Poultry Sci. 28:* 467-469. 1949.—Data include 263 dams and 1626 daughters, all R. I. Reds, used over an 8-yr. period in breeding for high fecundity. Breeding females selected without a progeny record gave daughters with the same mean productive ability as those having a progeny test. It was concluded that the size of the breeding flock was too small and that the standard of selection was too low to increase the productive level of the daughters.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A., and D. W. TALMADGE. *(Agric. Expt. Sta., Amherst, Mass.)* INBREEDING IN A CLOSED FLOCK. *Genetics 34:* 390-394. 1949.—A study was made in a completely closed flock of R. I. Reds bred for high fecundity over 5 generations. Close inbreeding was regularly avoided in making the matings. The maximum degree of inbreeding was 5.33%. Those families that were inbred somewhat showed a lower egg production than those not inbred. The reduced egg production was due chiefly to lower intensity and to a slightly higher incidence of winter pause in inbreds. Inbreeding reduced viability since the non-inbred families had a mortality rate of 27% compared with 35% when the inbreeding coeff. was 12% or greater.—*Authors.* (Biological Abstracts)

HICKS, A. F., JR. *(Univ. of Calif., Berkeley).* CROOKED TOES. POULTRY DEFECT MAY BE HEREDITARY NUTRITIONAL OR MANAGEMENTAL IN TYPE. *California Agriculture,* Vol. 3, No. 10, October 1949, page 14-15.

In past years crooked toes in chickens have been considered to be of two types, one due to a nutritional deficiency and another caused by faulty management. A third type which has not been described until recently is hereditary in nature and as such, is of considerable interest to breeders and hatcherymen.

In 1943 a selection experiment was initiated to increase the incidence of the defect. Not only has the incidence been increased by selection from one to two to over 90%, but the severity of expression has also greatly intensified in the crooked toe line. There is no doubt concerning the hereditary nature of the deformity in view of these results and of data from other experiments conducted. (Experiment Station Record)

JULL, MORLEY A. *(Univ. of Maryland).* FLOCK IMPROVEMENT. *Hatchery & Feed,* November, 1949, 23: 62.

The reported facts that dark brown-shell eggs hatch better than light brown-shell eggs has puzzled me for some time because it is difficult to believe that the amount of pigment deposited in the shell has any direct effect on hatchability. Nevertheless, the results of three observations have shown definitely that dark brown eggs hatched better than light brown ones.

Dr. George F. Godfrey, formerly of the poultry department of Ohio State University and at present of the poultry department of Oklahoma Agricultural College, first showed that among New Hampshire, Barred Rock, and White Rock hatchery flocks in Ohio, eggs with dark shell color hatched much better than eggs with light colored shells.

At the University of Missouri, Professors E. M. Funk and J. F. Forward secured similar results with eggs produced by the University flock of New Hampshires. (Experiment Station Record)

KNOX, CHARLES W., C. D. GORDON *(U. S. Dept. Agric., Beltsville, Md.)* and N. R. MEHRHOF. PERFORMANCE OF RHODE ISLAND REDS AND LIGHT SUSSEX AS COMPARED WITH THAT

OF THEIR F_1 AND THREE-WAY CROSSBREDS. *Poultry Sci. 28:* 415-419. 1949.—F_1 and 3-way crossbred pullet progeny from pullet breeders selected from performance records to Feb. 1 were significantly better than the parental stock used in the crosses in regard to body wt. at 10 and 20 weeks of age and maturity (February wt.), with the exception of the 3-way cross involving the White Leghorn as one of the parents. Egg production, egg wt., and viability were better in all the crossbreds than in the standrardbred R. I. Reds and Light Sussex. There was as great an incidence of broodiness in the F_1 and 3-way crossbreds, with the exception of the cross involving the White Leghorns, as in the Light Sussex, which had the greater incidence of broodiness of 2 parental breeds, the Light Sussex and R. I. Reds. On the avg., the F_1 and the 3-way crossbreds began to lay at an earlier age than either of the 2 parental breeds kept as controls at Brooksville.—*Authors.* (Biological Abstracts)

MAW, A. J. G. *(Pennsylvania State Coll., State College, Pa.)* PERFORMANCE OF CROSSES OF CERTAIN INBRED LINES. *Poultry Sci. 28:* 499-503. 1949.—Progenies resulting from 6 crosses involving 7 inbred lines of S. C. White Leghorns developed at the Regional Poultry Research Laboratory, East Lansing, Michigan, were tested for viability and economic characters at the Pennsylvania Expt. Station. No differences between the crosses and the controls were evident in respect to mortality. The loss from lymphomatosis was low. In egg production the crosses ranged from 137 to 195 eggs per bird on a hen-housed basis. The progeny of one cross was superior to all others, having the highest egg production and the lowest mortality percentage.—*A. J. G. Maw.* (Biological Abstracts)

OLSSON, NILS, and CARL WADNE. *(The National Animal Experiment Station, The Royal Agr. Coll. of Sweden).* A MUTATION IN CHICKEN. *Hereditas, 35,* 1949.

In 1946 a Rhode Island Red pullet was found lacking flight feathers (primaries and secondaries) in its wings. The tail was normally feathered. To investigate whether this character was a modification or a hereditary character this pullet was mated (1947) to a normal male of the same breed. All the offspring (F_1) from this mating looked normal and none lacked flight feathers. The F_2-mating (1948) showed that the new character (flightless) was hereditary and thus a mutation and probably depends on a recessive gene to the factor for normal wings. Previously flightless mutations are not shown in Sweden. No difference between the wings of normal pullets and those lacking primaries and secondaries was found in the chicks at 8 weeks of age. This indicates the presence of these feathers in the wings before the first moulting. *Nils Olsson.*

PALAFOX, A. L., J. E. ALICATA, and L. KARTMAN. *(U. Hawaii, Honolulu.)* BREEDING CHICKENS FOR RESISTANCE TO CECAL COCCIDIOSIS. *World's Poultry Sci. Jour. 5:* 84-87. 1949.—A continuation of the work of Alicata and Quisenberry (Hawaii Agr. Exp. Sta. Rpt. 1944, 44, p. 127. 1947) shows that mating F_1 individuals from within lines designated as susceptible (S) and resistant (R) to cecal coccidiosis produced offspring which showed high and low resistance. Percentage survival of offspring from the resistant and susceptible lines was 40.2 and 15.9, respectively. Considerable variation in the degree of resistance among F_2 progeny was observed. Further tests of offspring from R x R, S x S, R x S and S x R matings indicate that inherited resistance to cecal coccidiosis is governed by multiple factors.—*Authors.* (Biological Abstracts)

WARREN, D. C. *(Agric. Expt. Sta., Manhattan, Kans.)* LINKAGE RELATIONS OF AUTOSOMAL FACTORS IN THE FOWL. *Genetics 34:* 330-350. 1949.—22 autosomal factors in the fowl have been included in a study of linkage relations. This study provides additional data on 3 of the 5 well established autosomal linkage groups in the chicken. The character fray has been added to the crest-dominant white-frizzle group. Evidence is presented for including naked-neck in the silkie-flightless group instead of in the blue egg-pea comb-marbling group. Duplicate has been added to the duplex comb-multiple spur-polydactyly group. Addi-

tional data were presented on the map distance on these autosomes and for independent assortment of a number of other autosomal characters. —*D. C. Warren.* (Biological Abstracts)

WARREN, D. C., and HERMAN SMITH. *(Agric. Expt. Sta., Manhattan, Kans.)* THE ORIGIN OF BREEDS OF CHICKENS. *Jour. Agric. Res. 78:* 397-403. Illus. 1949.—A study was made of 245 skulls of chickens representing 27 breeds and vars. The purpose of the study was to check upon the statement of Tegetmeier that the Asiatic breeds of poultry have distinctive structural modifications of the skull. He cited this as evidence that the Asiatic group had an evolutionary history independent of most other breeds. No evidence was found for his contention that the shape of the foramen magnum differs in the Asiatic group of chickens. Some difference was found in the nature of the groove between the frontal bones of the Mediterranean and Asiatic groups of chickens.—*D. C. Warren.* (Biological Abstracts)

PHYSIOLOGY

BIRD, S., L. I. PUGSLEY and M. O. KLOTZ. THE QUANTITATIVE RECOVERY OF SYNTHETIC ESTROGENS FROM TISSUES OF BIRDS (GALLUS DOMESTICUS), THE RESPONSE OF THE BIRDS' TESTIS, COMB AND EPIDERMIS TO ESTROGEN AND OF HUMANS TO INGESTION OF TISSUES FROM TREATED BIRDS. *Endocrinology, 41:* 282, October, 1947.

Attempt to recover estrogenic materials from various tissues of treated birds showed that muscular tissues are very low in potency whereas tissues heavily infiltrated with lipids possess high potency. It appeared therefore that fractions of exogenous fat soluble estrogens are taken up chiefly by lipid containing tissues in preference to other tissues.

After oral administration the dimethyl ether of diethylstilbestrol proved slightly more potent than the dienestrol diacetate but otherwise the order of potency was unchanged. Dimethyl ethers seem to have the property of being more potent orally than subcutaneously.

Effective suppression of maleness in young cockerels 10 to 12 weeks old was obtained on a total dosage of 13X2.613 mg. estrogen per bird. Testes as well as combs were affected. A threefold dosage of 13X8.145 did not have any greater effect and it is concluded that 3.3 mg. estrogen per 100 gm. of feed for 12 days is about optimum at this age of the birds. In untreated controls there was a highly significant correlation between size of the comb and development of testis. In 52 weeks old birds 20 mg. estrogen per day was not sufficient to suppress maleness completely but in spite of this partial failure, hypertrophy of epidermis was remarkable. (Experiment Station Record)

BLAKELY, R. M., and R. W. ANDERSON. *(Dom. Expt. Sta. Swift Current, Saskatchewan, Canada.)* THE INFLUENCE OF THIOURACIL ON GROWTH, FATTENING, FEED CONSUMPTION AND THYROID WEIGHT OF TURKEY BROILERS. *Poultry Sci. 28:* 185-188. 1949—Six-weeks-old turkey poults were fed a growing mash diet, to which was added 0.1% thiouracil, during a 21-day feeding trial. A depression in wt. gains was recorded for both males and females. In the case of males it was 0.85 lb. and for females 0.63 lb. below the corresponding controls. Feed consumption in the thiouracil fed group was 1.21 lb. per bird less than for the controls but efficiency of feed utilization was slightly lower. Percentage skin fat of the thiouracil-fed birds averaged 2.25 times greater in the males and in 1.92 times greater females than that of the corresponding controls. The feeding of 0.1% thiouracil caused increases in thyroid wts. per 100 g. body wt., of 5.1 times and 6.1 times, for males and females, respectively.—*R. M. Blakely.* (Biological Abstracts)

BORGATTI, G. *(U. Bologna.)* BROMO E GONADI NEL POLLO. (BROMINE AND GONADS IN THE CHICKEN.) *Arch. Sci. Biol. 32:* 67-84. 5 fig. 1947.—The effect of Br treatment on the growth and gonads of chickens is compared with similar studies performed on mammals. The expt. was begun on 9-day-old White Leghorn chicks. Br treatment

consisted of daily subcut. injns. of 3.5% soln. of NaBr, the dose being equal to 0.2 g./kg. until the animals were 8 months old. Succeeding generations were raised from treated and non-treated females of this group. Br had no effect on the growth of the birds. The gonads of males were atrophied, with seminiferous tubules in the infantile condition, but there was no apparent modification of the secondary sexual characters in comparison with the normal control animals. The ovaries seemed little if any affected by the treatment judging from the number of eggs laid and their fertility.—*L. H. Kleinholz.* (Biological Abstracts)

BURMESTER, B. R. *U. S. Region, Poultry Res. Lab., East Lansing, Mich.)* THE INFLUENCE OF SEX HORMONES UPON THE OCCURRENCE OF PROLAPSE IN CHICKENS. *Poultry Sci. 27:* 745-750. 1948.—Lots of 32 to 40 inbred White Leghorn chickens 28 to 600 days of age were implanted with high and low dosages of diethylstilbestrol and testosterone dipropionate pellets. A control lot received implants of cholesterol pellets. Chickens which received androgen had a significantly higher incidence of prolapse than sibs implanted with stilbestrol of cholesterol. The lowest incidence of prolapse occurred in the high dosage stilbestrol lot, though the difference between it and the control group was not significant. Another expt. showed that diethylstilbestrol administered to adult males and capons produced a marked spread in the pubic bones and rendered the abdomen soft and pliable, whereas males and capons treated with testosterone were only slightly different from the untreated controls. The results suggest that certain birds have a tendency to prolapse either because of insufficient estrogens or because of excessive amts. of androgens. The effect is presumably brought about by hormonal influence of ligaments of the oviduct, spread of the pubic bones, size of the cloaca and vent, and the pliableness of the abdomen.—*B. R. Burmester.* (Biological Abstracts)

CRAVENS, W. W., and E. E. SNELL. *(Univ. of Wisconsin, Madison)* DESOXYPYRIDOXINE AND DEVELOPMENT OF THE CHICK EMBRYO. *Fed. Proc. 8:* 380-381. 1949.—An Abstract. (Biological Abstracts)

DRIGGERS, J. CLYDE, and C. L. COMAR. *(Agric. Expt. Sta., Gainesville, Fla.)* THE SECRETION OF RADIOACTIVE CALCIUM (Ca^{45}) IN THE HEN'S EGG. *Poultry Sci. 28:* 420-424. 1949.—Radioactive Ca (Ca^{45}) as a chloride soln. is used in estimating the rate and amt. of Ca mobilized in the yolk, white and shell of hen's eggs. The method of tissue analysis and radioactivity measurement are described. Some labeled Ca was detected in an egg shell laid 15 min. after ingestion while approx. 1/3 of the ingested dose was found in the egg laid 24 hrs. after dosage. Appreciable quantities of Ca^{45} were found in the blood and bones after 21 days of heavy production.—*J. C. Driggers.* (Biological Abstracts)

FOX, MARJORIE HOPKINS. *(U. California, Berkeley.)* ANALYSIS OF SOME PHASES OF MELANOBLAST MIGRATION IN BARRED PLYMOUTH ROCK EMBRYOS. *Physiol. Zool. 22:* 1-22. Illus. 1949.—Systematic testing of epidermal areas of Barred Rock embryos by transplantation to White Leghorn embryos reveals an atero-posterior gradient in onset of migration of melanoblasts beneath the epidermis adjacent to neural tube. Characteristics of this gradient are explainable in terms of Holmdahl's hypothesis of primary and secondary body development. Tardy establishment of melanoblasts in epidermis above the first 5 somites is associated with formation here of the head spot, an area of unpigmented or weakly pigmented down feathers. The migration of melanoblasts lateral to the somites is directed precociously towards the limb buds. Proximo-distal and dorso-ventral gradients of migration exist within the limb buds, the former associated with the unpigmented or weakly pigmented down feathers at the wing tips. The presence of melanophores in the coelomic lining and viscera of control embryos demonstrates that there is no selective migration of melanoblasts into the epidermis. Melanoblasts enter the mesonephroi at about 123 hrs. of incubation; although the testes frequently contain melanophores after the 14th day, melanoblasts could not be detected in the indifferent gonads by

167 hrs. of incubation. Hensen's node and the definite tail bud posses the capacity to yield melanophores when transplanted. The young, developing tail bud is unpredictable in this respect. Histological examination of nodal and tail bud grafts revealed no correlation between presence of nervous tissue and of melanophores in these grafts.—*M. F. Fox.* (Biological Abstracts)

GAERTNER, ROBERT A. *(Univ. of Maryland).* DEVELOPMENT OF THE POSTERIOR TRUNK AND TAIL OF THE CHICK EMBRYO. *Journal of Experimental Zoology, 111:* 157, July, 1949.

Virtually all of the increase in length of the chick embryo after the 21-somite stage is the result of elongation at the anterior boundary of the tailbud where differentiated and undifferentiated tissues merge. There is no appreciable increase in length of those tissues and organs which already lie anterior to the tail-bud.

As elongation occurs, the tail-bud is pushed posteriorly, and, since the cloacal membrane is a fixed structure, the tail fold is formed. (Experiment Station Record.)

GILBREATH, J. C., and GEORGE T. DAVIS. *(Oklahoma A. and M. Coll., Stillwater.)* A FERTILITY STUDY WITH TURKEYS USING DIFFERENT CONCENTRATIONS OF SEMEN. *Poultry Sci. 28:* 408-410, 1949.—40 young Bronze hens were divided equally into 4 pens and assigned to lots so that 2 hens received the same concn. of semen from the same male. One tom was allotted to each pen. The semen concns. used were undiluted, 1/10, 1/20, 1/50, and 1/100. A normal physiol. saline was used as diluent. Four inseminations were made over a 54-day period. The semen was injd. directly into the vagina. The unit dosage was 0.05 cc from a standard 1 cc. tuberculin syringe. Ordinary mixing pipettes were used to measure and dilute the semen. The fertility of all eggs was checked on the 5th day of incubation and doubtful eggs were broken out for macroscopic examination. The results in fertility percentages were: 84.25% for undiluted, 39.61% for 1/10, 33.69% for 1/20, 16.87% for 1/50, and 5.51% for 1/100. The analysis of variance showed a significant difference between treatments but no difference in the fertilizing ability of the semen from the 4 males.—*J. C. Gilbreath.* (Biological Abstracts)

GRAU, C. R., and M. KAMEI *(U. California, Berkeley.)* DELAYED OVIPOSITION OBSERVED IN HENS FED PURIFIED DIETS. *Poultry Sci. 28:* 469-471. 1949.—Delayed oviposition was observed among hens which were fed purified diets. The duration of the delay, as detd. by external palpation in the uterine region, ranged from a few hrs. to as long as 1 month. In one study of 50 hens observed for 21 days, 3.1% of the eggs were delayed, and 22% of the hens were affected. Some of the delays observed were complicated by the presence of a 2d egg in the uterus before the 1st one was laid. Unless this occurred, shell thickness was not increased markedly by delayed oviposition. The incidence of delayed eggs in birds fed a stock diet was only 0.65%.—*C. R. Grau.* (Biological Abstracts)

HAYS, F. A., and D. W. TALMADGE. *(U. Massachusetts, Amherst.)* HATCHABILITY IN RHODE ISLAND REDS AS AFFECTED BY AGE OF PARENTS. *Jour. Agric. Res. 78:* 285-290, 1949.—A study was made of the complete hatching records of R. I. Red chickens bred for high fecundity over a 15-yr. period to discover possible relations between age of parents and hatchability. The data included 135 cockerels, 143 yearlings, 60 2-yr.-olds and 12 3-yr.-olds as male parents, and 821 pullets, 570 yearlings, 143 2-yr.-olds, and 33 older hens as female parents. The following deductions were made from these data: Hatchability declines at a slow rate as males grow older and at a somewhat higher rate as females grow older. Males used in successive yrs. exhibit some decline in hatchability. Females tested in successive yrs. tend to show a declining hatchability. Identical matings in successive yrs. demonstrate this effect of age. Embryonic death records show a greater incidence of early embryonic deaths from eggs of older parents as well as a higher incidence of full-term live embryos that failed to emerge. Late and very late embryonic deaths were no higher in eggs from older than from

younger parents. No specific causes for the changes in embryonic losses with increased age of parents have been found.—*F. A. Hays.* (Biological Abstracts)

HENDERSON, E. W., and L. R. CHAMPION. *(Agric. Expt. Sta., East Lansing, Mich.)* RELATIONSHIP BETWEEN SPEED OF HATCHING AND GROWTH RATE OF CHICKS. *Amer. Egg and Poultry Rev. 10:* 46, 48, 66. 1949.—Eggs used in the expt. were from Single Comb White Leghorns, R. I. Reds, Barred Plymouth Rocks, Dark Cornish x Barred Plymouth Rocks and Dark Cornish x White Leghorns. Eggs were 1 day to 2 weeks old when they were all placed in incubator at the same time. On the 18th day of incubation the eggs were transferred to hatching compartments. Chicks were removed every 6 hrs. after hatching began and were recorded and identified by wing bands. The chicks emerging first showed a tendency to be heavier at 8 weeks of age than those emerging later, but in only 1 group was the correlation sufficiently high to be significant.—*H. G. Lindquist.* (Biological Abstracts)

HINSHAW, W. R., VETERINARY PROBLEMS IN POULTRY PRODUCTION. *(Veterinary Medicine, XLIV:* 519, December, 1949).—According to Maits (*Country Gentleman,* 119: 58, Sept. 1949), a system has been worked out by the USDA Research Center, Beltsville, Md., which will permit shipping only fertile hatching eggs. This is accomplished by preincubation of the eggs for 18 hours, for chicken eggs, and 24 hours for turkey eggs. They are then candled and the infertile ones removed. The good eggs are then chilled to 50° to 55°F. for a minimum of two hours to stop embryo growth, after which they can be shipped to hatcheries for further incubation. M. W. Olsen, USDA poultry specialist, believes that preincubation can save a lot of the shipping and handling charges for the 15% of the hatching eggs that are now shipped as infertiles. Olsen has shipped "arrested" chicken eggs as far as Des Moines, Iowa, and had them returned to Beltsville for continued incubation, and has had a hatchability of 80% of all eggs originally put in the incubator. (Experiment Station Record)

HIXSON, FLOYD M., and GEORGE F. GODFREY. *(Oklahoma Agric. Expt. Sta., Stillwater.)* AN ABNORMAL TURKEY EGG. *Poultry Sci. 28:* 624-625. 1949.—An abnormal turkey egg consisting of 2 large egg-like regions, three slender elongated regions, and a follicle-like structure is described and illustrated. A possible physiological explanation accounting for the formation of such an egg is presented.—*G. F. Godfrey.* (Biological Abstracts)

HUSTON, TILL M. *(U. Illinois, Urbana),* and ROBERT S. WHEELER. *(U. Georgia, Athens.)* EFFECT OF SYNTHETIC THYROPROTEIN ON SEASONAL VARIATION IN VOLUME AND CONCENTRATION OF COCK SEMEN. *Poultry Sci. 28:* 262-269. 1949.—Feeding thyroprotein (0.02% of the diet) to mature R. I. Red cocks did not improve semen quality or prevent the normal seasonal decline in semen production. Treatment resulted in a highly significant reduction in amt. of seminal fluid although total sperm production was not affected. There were no differences either in fertilizing capacity of these males when mated naturally or in the hatchability of the fertilized eggs. Feed consumption was not affected by treatment.—*Lawrence Morris.* (Biological Abstracts)

KUMARAN, J. D. S., and C. W. TURNER. *(U. Missouri, Columbia.)* THE NORMAL DEVELOPMENT OF THE TESTES IN THE WHITE PLYMOUTH ROCK. *Poultry Sci. 28:* 511-520. Illus. 1949.—A study is reported of the normal growth in wt. of the testes of White Plymouth Rock cockerels from 4 to 20 weeks of age. These testes were studied histologically to observe the progressive development of the component parts, —the seminiferous tubules and the interstitial cells. Four stages of spermatogenesis were observed as follows: (1) During the first 5 weeks the tubules are organized and multiplication of the basal layer of cells, the spermatogonia, occurs. This causes a gradual increase in the diam. of the tubules. (2) The primary spermatocytes begin to appear at about

the 6th week. During the next 2 to 3 weeks growth of the layer of primary spermatocytes takes precedence over the further multiplication of the spermatogonial layer. (3) The secondary spermatocytes begin to appear at about 10 weeks of age as a result of the meiotic (reduction) division of the primary spermatocytes. (4) Spermatids begin to appear in the tubules of 12-weeks-old birds. By the 20th week spermatids are usually present in all the seminiferous tubules. During this period there is a great growth in the length of the tubules thus increasing the capacity of the testes to produce mature spermatozoa. The development of the connective tissue stroma is correlated with tubule growth. The cells of Leydig were beginning to appear in the stroma by the 14th day. While these cells may secrete some male hormone before the 8th week, the marked growth of the comb following that time is believed to indicate increased hormone secretion. A 2d further increase in male hormone secretion is believed to occur after the 12th week associated with the marked growth in tubule length and related connective tissue development which occurs at that time. It was suggested that the early maturation of limited numbers of spermatids and the secretion of male hormone by the cells of Leydig enable cockerels to fertilize ova and thus perpetuate the germ line relatively early. The great increase in the testes wt. after sexual maturity represents marked growth in seminiferous tubule length associated with interstitial tissue cell growth and associated male hormone secretion. This is a period of increasing capacity of cockerels to produce semen.—*Authors.* (Biological Abstracts)

MUELLER, CLYDE D. *(Agric. Expt. Sta., Manhattan, Kans.)* ARTIFICIAL INSEMINATION FOR PROGENY-TEST BREEDING IN POULTRY. *Poultry Sci. 28:* 143-145. 1 fig. 1949.—A single operator can obtain fowl semen in the following manner: the male bird is held facing left with his legs secured between the knees of the seated operator. Both hands are thus free to use in the collection of semen from the cock bird. The laying female is held securely in the left hand. The right hand and middle fingers of the left hand are used to exert pressure on the abdomen of the bird, causing eversion of the oviduct. The right hand is then freed to transfer semen from a glass vial to the oviduct by means of a common medicine dropper. By this method, hens can be mated individually at the rate of 100 or more per hr. in floor pens. Fully pedigreed progeny from a large number of sires and dams may be obtained without requiring individual pen facilities.—*C. D. Mueller.* (Biological Abstracts)

OAKBERG, EUGENE F. *(U. S. Region. Poultry Res. Lab., East Lansing, Mich.)* QUANTITIVE STUDIES ON THE PANCREAS AND ISLANDS OF LANGERHANS IN RELATION TO AGE, SEX, AND BODY WEIGHT IN WHITE LEGHORN CHICKENS. *Amer. Jour. Anat. 84:* 279-310. 1949.—45 male and 45 female White Leghorn chickens 1 to 300 days old, showed a greater relative increase in pancreas than in body wt. from 1 to 20 days and a gradual decline in the pancreas; body wt. ratio after 20 days. Ratios for females were significantly higher than for males. Numbers of both alpha and beta islets increased rapidly from 1 to 100 days; thereafter, beta-islet number rose slowly, while alpha-islet number remained about constant. Number of both alpha and beta islets per g. body wt. increased from 1 to 10 days, and decreased from 10 to 300 days. Islet number per g. pancreas wt. decreased progressively from 1 to 300 days. Different distribution of alpha and beta islets in the body of the pancreas was interpreted as evidence for individuality of alpha and beta cells. Estimation of beta islet volume indicated relatively more islet tissue in younger birds. Both high and low number and small and large islet size were found normal for individuals of the same age and sex. Consequently, quantitative detns. are required before increase or decrease of islet tissue may be established.—Auth. (Wistar Bibl. Serv.)

OLSEN, M. W., and S. K. HAYNES. *(Bur. Animal Indust., Beltsville, Md.)* EGG CHARACTERISTICS WHICH INFLUENCE HATCHABILITY. *Poultry Sci. 28:* 198-201. 1949.—A study was conducted in

which 47,950 freshly laid eggs were candled to determine whether or not certain egg characteristics affect fertility and hatchability. Of these eggs, 1894, or about 4%, had one of the designated characteristics. The hatchability of fertile eggs showing these characteristics was as follows: small eggs, 80%; large blood spots, 71.5%; extra large eggs, 70.8%; misplaced air cells, 68.1%; misshapen eggs, 48.9%; cracked eggs, 53.2%; eggs with poor shells, 47.3%; and loose air cells, 32.4%. The avg. hatchability of all defective eggs was 61.8% of fertile eggs while the avg. hatchability of the 3031 control eggs was 87.2% of fertile eggs. Infertility in all instances was higher in each of the groups of eggs having undesirable characteristics, averaging 28.8% for all types of defective eggs, as compared with 17.7% for the controls.—*M. W. Olsen.* (Biological Abstracts)

OLSEN, M. W., and B. H. NEHER. THE SITE OF FERTILIZATION IN THE DOMESTIC FOWL. *Jour. Exptl. Zool. 109:* 355-366. 1949.—A study was conducted to determine the site of fertilization of the hen's ovum. A group of hens that had been artificially inseminated was sacrificed 15 min. after oviposition. Mature, ovarian follicles were removed and allowed to ovulate in vitro. Each newly ovulated ovum was then transferred to the oviduct of a virgin or non-mated hen. 12 hard-shelled eggs were obtained, all of which proved infertile. Mature follicles from the ovaries of 11 virgin hens served as controls. After ovulation in vitro, these ova were tranferred to the oviducts of 11 hens, all of which had been previously inseminated. 9 of the 11 hard-shelled eggs obtained were fertile, one of which hatched. Additional evidence on the site of fertilization was obtained by placing sperm directly into the ovarian pocket of 4 hens and into the infundibula of 5 hens. This was accomplished by making an abdominal incision, the operation being performed in each instance 15 min. following oviposition and just before ovulation of the succeeding ovum. 8 of the 9 hard-shelled eggs obtained proved infertile. It is concluded that fertilization in the bird normally occurs soon after ovulation in the infundibulum and not in the ovary. —*Auth.* (Wistar Bibl. Serv.)

O'NEIL, J. B., J. R. JOWSEY, C. C. LEE, and J. W. T. SPINKS. DISTRIBUTION OF P32 IN CHICK EMBRYOS. *Canadian Journal of Research, 27,* Sec. D.: 223, August, 1949.—From the embryos and chicks that were analyzed, radioactivity was found in all fractions examined. As is to be expected, the greatest amount of activity was found in the tissues that contain the largest quantity of phosphorus. Thus the fraction denoted "remainder of carcass", which consisted of all the bones except the tibiae and all the flesh except the leg muscles, contained about 40% of the total activity recovered from the embryos that died on the 18th day of incubation, about 50% of the total activity recovered from the chicks that died on the day of hatching, and about 55% of the total activity recovered from the chicks that died two days after hatching. The P32 in the yolk sac decreased from approximately 40% of the total activity in the embryos that died on the 18th day of incubation to less than 20% in the two-day-old chick. This is compatible with the well known fact that the yolk sac is rapidly absorbed during the first few days of life of the chick. (Experiment Station Record)

REYNIERS, J. A., P. C. TREXLER, R. F. ERVIN, M. WAGNER, T. D. LUCKEY, and H. A. GORDON. *(U. Notre Dame, Indiana.)* A COMPLETE LIFE CYCLE IN THE "GERM-FREE" BANTAM CHICKEN. *Nature (London) 163:* 67-68. 1949.—Of 17 surface-sterilized eggs in a germ-free system, 12 hatched, 1 died, 8 were sacrificed, and 2 cocks and a hen reached maturity on a semi-synthetic diet. The hen layed at 190 days, and one of first eggs hatched and maintained on a similar diet. Microbiological tests continued negative.—*Roland Walker.* (Biological Abstracts)

SERFONTEIN, P. J. REASONS WHY SOME EGGS DO NOT HATCH. *Farming in South Africa 24:* 280: 399-344. 1949.

The chief factors concerned with fertility and hatchability of eggs are discussed.—*A. M. Gericke.*

SPERBER, IVAR. *(Royal Agric. Coll., Sweden, Uppsala.)* THE EXCRETION OF SOME GLUCURONIC ACID DERIVATIVES AND PHENOL SULFURIC ESTERS IN THE CHICKEN. *Lanthrugshogskolans Annaler 15:* 317-349. 1948.—By the use of a method based on the existence of a renal portal system in birds, the excretion of some glucuronic acid derivatives and sulfuric esters has been investigated in the chicken. Methyl glucuronide is excreted by the tubules almost as efficiently as is phenol red. The apparent tubular excretion fraction averages 0.41. For phenyl glucuronide the apparent tubular excretion fraction is 0.23. Resorcinyl glucuronide is probably also excreted by the tubules. No indication of tubular excretion of pregnanediol glucuronide has been found. Glucuronic acid is not excreted by the tubules. The following sulfuric esters of phenols have been studied and found to be excreted by the tubules; - phenol sulfuric ester 0.15, resorcinol sulfuric ester 0.14, hydroquinone sulfuric ester 0.16, resorcinol di-sulfuric ester 0.3, hydroquinone di-sulfuric ester 0.12. Catechol sulfuric ester is also probably excreted by the tubules. Resorcinol is excreted by the tubules but is possibly to some extent coupled with glucuronic acid in the kidney and the resulting compound excreted. Hippuric acid, given in large quantities, decreased the excretion of all compounds investigated. Large quantities of methyl glucuronide and resorcinol di-sulfuric ester depressed the excretion of phenol red.—*A. L. Bakke.* (Biological Abstracts)

SPINKS, J. W. T., M. R. BERLE, and J. B. O'NEIL. DETERMINATION OF THE FATE OF CALCIUM IN THE LAYING HEN BY MEANS OF RADIOCALCIUM (Ca^{45}), *(Univ. of Saskatchewan, Saskatoon, Canada). Science,* September 30, 110: 332. 1949.

The recovery of calcium was at a maximum (29%) in the shell of the second egg and decreased very rapidly in the shells of later eggs. This is in agreement with the well-known fact that the shell is laid down in about 20 hr. of oviposition.

A large portion (50%) of the calcium was excreted within 48 hr.

Since the calcium fed in a given day appears in a number of eggs, it follows that the calcium in any given egg comes from the calcium fed on many different days. (Experiment Station Record)

STADELMAN, W. J., R. V. BOUCHER, and E. W. CALLENBACH. *(Agric. Expt. Sta., State College, Penna.)* INFLUENCE OF TOE REMOVAL ON CALCIFICATION AND BODY WEIGHT OF POULTS AND CHICKS. *Poultry Sci. 28:* 161-164. 1949.—Since recent evidence has shown that toe ash is an acceptable measure of calcification in growing chicks and poults, expts. were conducted on 240 W. H. turkey poults and 480 S. C. W. L. chicks fed rachitogenic and near-normal rations, and subjected to variable toe-removal treatments. Removal of the center toe at either 1, 2 or 3 weeks of age had no measurable effect on calcification or body wt. at 4 weeks of age of either poults or chicks.—*R. V. Boucher.* (Biological Abstracts)

TAYLOR, KENNETH M. and A. MANDEL SCHECHTMAN. IN VITRO DEVELOPMENT OF THE EARLY CHICK EMBRYO IN THE ABSENCE OF SMALL ORGANIC MOLECULES. *Journal of Experimental Zoology, 111:* 227, July, 1949.—

Explanation of chick embryos in the primitive streak and head-fold stages, shows that white yolk is a better culture medium than whole yolk for the support of early differentiation *in vitro.*

The effectiveness of yolk extracts as a culture medium for the early embryo is not dependent solely upon the free sugar content of yolk.

The hypothesis is advanced that circulatory failure *in vitro* may be attributed to an insufficiency of preformed proteins necessary for the formation of the early embryonic blood plasma. (Experiment Station Record)

TAYLOR, LEWIS W. *(Univ. of Calif., Berkeley)* SEXING OF POULTRY; ACCURATE IDENTIFICATION AT HATCHING POSSIBLE BY VISIBLE EFFECTS OF HERITABLE CHARACTERS. *California Agriculture,* November, 1949, 3: 6.—Three principal methods

are now used in sexing baby chicks: sex-linked crossbred matings, autosexing breeds or varieties, and the cloacal—so-called Japanese—method of examination of the copulatory organ. (Experiment Station Record)

TRINKAUS, J. PHILIPS. *(Johns Hopkins U., Baltimore, Md.)* FACTORS CONCERNED IN THE RESPONSE OF MELANOBLASTS TO ESTROGEN IN THE BROWN LEGHORN FOWL. *Jour. Exptl. Zool. 109:* 135-169. 2 pl. 1948.—Both the red and the black feather pigments of the Brown Leghorn are deposited in epidermal cells of regenerating feathers by pigment cells. These melanoblasts have a genetic capacity to respond to estrogen. Study of the transition from black to red melanophores in breast feather germs of capons, 48 hrs. after estradiol admn., yielded no evidence for the existence of "transitional" melanophores, containing both red and black granules. Admn. of estrogen to Brown Leghorn chicks (Juhn et al.), and embryos causes no feminization of feathers until the normal appearance of sex-dimorphism in each feather tract. Likewise, when estradiol is added to in vitro cultures of melanoblasts from embryos, there is no change in the frequency of black and red melanophores, in contrast to a slight increase in red melanophores when estradiol is added to cultures of melanoblasts from breast feather germs of adults. Melanoblasts from regenerating feathers of adult Brown Leghorns grafted to the wing bud of White Leghorn embryos produce a pigmentation pattern in host wing feathers which is indistinguishable from that of down and juvenile wing feathers of Brown Leghorns controls. This pigmentation is unaffected by estradiol injn. Melanoblasts of the adult as well as of Brown Leghorn embryos are, therefore, truly embryonic cells, whose capacity to respond to estrogen apparently depends upon the maturity of the epidermis.—*Auth.* (Wistar Bibl. Serv.)

VENZKE, W. G. *(Ohio. Sta. U., Columbus.)* MORPHOGENESIS OF THE THYROID GLANDS OF CHICKEN EMBRYOS. *Amer. Jour. Vet. Res. 10:* 272-281. Illus. 1949.—A series of 420 embryos, ranging from 12 hrs. of incubation to hatching, was used for the morphologic studies. The thyroid gland begins development from an unpaired median ventral evagination of the pharyngeal epithelium at about 36 hrs. of incubation. The thyroid anlage loses connection with the pharynx at 96 hrs. and becomes bilobed by 120 hrs. of incubation. Nonfollicular spaces appear in the thyroid glands at 148 hrs. and distinct epithelial cell plates appear at 165 hrs. of development. Intracellular chromephobic colloid first appears at 240 hrs., and the first primary follicles at 260 hrs. Chromophilic colloid appears at 295 hrs. of incubation, at which time the follicles are typical of those present in the adult thyroid. Primary follicular cavities are formed by secretion and coalescence of the chromophobic colloid which has its origin near the nucleus on the side of the cell next to the future lumen of the follicle. Growth of follicles is achieved by fusion of the follicular epithelium with cells which have not yet organized into follicular formation, and by follicular cell division. Since the follicular cells lining a follicle may secrete either chromophobic or chromophilic colloid, a follicle contains 2 types of colloid. Chromophobic colloid mixed with chromophilic colloid gives the follicular colloid a vasculated appearance. Therefore, it is concluded that the previously described vacuoles in the follicular colloid are not true vacuoles. The follicular epithelial cell heights vary only slightly during embryonic life. There is a progressive increase in the mean follicular diams. from 295 hrs. of incubation until hatching.—*W. G. Venzke.* (Biological Abstracts)

VONK, H. J., G. BRINK, and N. POSTMA. *(U. Utrecht.)* DIGESTION IN THE STOMACH OF BIRDS. I. THE ACIDITY IN THE STOMACH OF YOUNG CHICKENS. *Proc. K. Nederland Akad. Wetenschap. Amsterdam 49:* 972-982. 1946.—Foods containing variable amts. of protein produce differences in gizzard pH of chickens only when they are about 3 weeks old. The food with the highest protein content produced the lowest pH values. About 7 weeks after birth these differences disappear. The gizzard contents always shows a higher acidity than that of the glandular stomach. In 23-day-old chicks the gizzard con-

tents avg. pH 2.77; in 52-day-old chicks they avg. pH 3.18; in adult cocks, pH 3.06. The pH in chickens less than 3 weeks permits vigorous peptic activity. In adult fowls this action must be slower because of the higher pH. This is probably compensated by the vigorous movements of the gizzard.—*A. J. Vonk.* (Biological Abstracts)

WANG, HSI. *(U. Chicago).* MODULATION OF TRACT SPECIFICITY BY ESTROGENIC HORMONE IN EXPERIMENTALLY PRODUCED FEATHER-CHIMAERAE OF BROWN LEGHORN CAPONS. *Jour. Exptl. Zool. 103:* 451-501. Illus. 1949.—Combinations of half breast and saddle feather papillae were made on plumage sexdimorphic Brown Leghorn capons. Resulting feather-chimaerae of distinct types, each bearing evidence of preservation of tract specificity of the components, were subjected to estradiol benzoate injd. daily for the entire regeneration period beginning from the 14th day. Expts. involved 3 successive generations, the 1st, at 8 RU per 100 g. body wt, the 2d, a normal generation without hormone, and the 3d with dosage increased to 40 RU. Normal breast and saddle feathers under the same hormone served as controls. In bilateral, pseudo-bilateral and longitudinal chimaerae each component responded in a manner typical of the tract from which it came; in transverse and twin chimaerae, however, a dominating influence of the estrogenic hormone was evident on its saddle component, and this, coupled with the latter's dorsal locus in the collar, made them respond preponderantly like saddle feathers. The hormone also affected a better rhachis formation from saddle cells in longitudinal and twin chimaerae. Other general influences of the hormone were reduction of growth rate, total length of feather and regeneration time, and increase of barb frequency, barbulation and width of vane in the saddle vane-half. The larger dosage used consistently caused further shortening of feather, a longer delay in emergence and an increased melanin deposition in the saddle component.—*Auth.* (Wistar Bibl. Serv.).

WILSON, WILBOR O. *(U. California, Davis.)* HIGH ENVIRONMENTAL TEMPERATURES AS AFFECTING THE REACTION OF LAYING HENS TO IODIZED CASEIN. *Poultry Sci. 28:* 581-592. 1949. —Laying pullets in a climatic chamber were exposed to air temps. for one week at each of the following: 70°, 80°, 90° and 100°F. It was observed that the pullets lost wt. as the temp. increased. Feed consumption at 100°F was only 42% of that at 70°F, while water consumption was increased to 135%. Body temp. was raised and heart rate was lowered by increases in environmental temps. Egg production practically ceased when air temps. reached 100°F, while egg wt. and shell thickness were reduced by continuous temps. over 70°F. Two or 3 weeks were required for egg wt. and egg shell thickness to return to normal following their depression due to high air temps. White Leghorns showed less rise in body temps. than New Hampshires or R. I. Reds. Egg production declined markedly in New Hampshires and R. I. Reds when the air temp. was 90°F and in Leghorns at 100°F. Feeding iodized casein did not prevent a decline in egg production due to high temps. Dubbing (the removal of comb and wattles) apparently did not influence the ability of White Leghorns to withstand high temps.—*W. O. Wilson.* (Biological Abstracts)

ZWILLING, EDGAR. THE ROLE OF EPITHELIAL COMPONENTS IN THE DEVELOPMENTAL ORIGIN OF THE "WINGLESS" SYNDROME OF CHICK EMBRYOS. *Journal of Experimental Zoology, 111:* 175, July, 1949.—Absence of wings in homozygous wingless chick embryos is related to a failure in the development of the apical ectodermal ridge of the wing bud. Similar defects in the apical ridge of the hind-limb buds occur later and produce less drastic abnormalities of the hind limbs of some of these embryos. (Experiment Station Record)

NUTRITION

BAELUM, J. ALFALFA MEAL FOR LAYING BIRDS. *Report 241 from the Agr. Research Laboratory, Copenhagen, Denmark.* (English Summary.)

Four experiments on alfalfa meal in the feed for laying birds are reported. In two trials alfalfa meal of different carotene content was given as sole source of vitamin A (carotene). A negative control group had very low egg production, inferior hatchability, and 60% of the birds died from avitaminosis A. Ten per cent alfalfa meal of low carotene content did not improve the results considerably, whereas a group fed 10% alfalfa meal, fairly rich in carotene, yielded about twice as many eggs as the two previous groups, hatchability was normal, and the mortality was only 10%. A supplement of carotene oil did not bring about as good results as the alfalfa meal of high carotene content.

When cod liver oil was supplied to all groups, alfalfa meal did not improve the egg production, but the alfalfa groups had better hatchability and darker yolk color.—*Nils Olsson.*

BIRD, H. R., A. C. GROSCHKE, and MAX RUBIN. *(U. S. Dept. Agric., Beltsville, Md.)* EFFECT OF ARSONIC ACID DERIVATIVES IN STIMULATING GROWTH OF CHICKENS. *Jour. Nutrition 37:* 215-226. 1949.—Growing chickens fed a diet consisting of 38% of yellow corn, 20% barley, 3% alfalfa meal, 35% soybean oil meal, 0.6% butyl alcohol fermentation solubles, 1.5% steamed bonemeal, 1% limestone flour, 0.7% manganized salt, and 0.2% vit. A and D oil, plus 1 mg. of nicotinic acid per 100 g., attained greater weights when fed 0.005% of 3-nitro-4-hydroxyphenylarsonic acid than when fed the unsupplemented basal diet. In 3 expts. the mean live weights of 6-week-old chickens fed the basal and supplemented diets, respectively, were 312 and 357 g., 357 and 411 g., and 366 and 437 g. The effect of higher or lower levels of the arsonic acid derivative was less favorable. This compound did not function as a substitute either for the unknown growth factor found in fish meal and cow manure or for methionine. On the contrary, with diets containing raw soybeans the arsonic acid derivative, the unknown factor, and methionine were mutually supplementary. The arsonic acid derivative was effective when fed with 35% or with 70% of commercially heated soybean meal, but less effective than the unknown factor. Other compounds comparable in their activity to 3-nitro-4-hydroxyphenylarsonic acid were phenylarsonic acid and p-hydroxphenylarsonic acid. M-nitrophenylarsonic acid also showed some activity. The following were tested and found inactive: p-chorophenylarsonic acid, Na arsenate, m-nitrobenzene-sulfonic acid, salicylic acid, 3-nitrosalicylic acid, and Na p-phenolsulfonate.—*Auth.* (Wistar Bibl. Serv.)

BUCKNER, G. DAVIS, W. M. INSKO, JR., AMANDA H. HENRY, and ELIZABETH FAULL WACHS. *(Agric. Expt. Sta., Lexington, Ky.)* RATE OF GROWTH AND CALCIFICATION OF THE STERNUM OF MALE AND FEMALE NEW HAMPSHIRE CHICKENS HAVING CROOKED KEELS. *Poultry Sci. 28:* 289-292. 1949.—The rate of calcification as shown by the progressive bone development in the keel was about the same in the males and females having crooked keels, to the 24th week. After that the development of the bone in the female crooked keel was more rapid. No evidence of perosis or other leg abnormaility was observed in the group of chicks having straight keels. Since mineral deficiency usually first involves the leg bones of growing chicks, it can be assumed that the mineral metabolism of chicks in this group was normal and that the growth of the sternums was normal also. However, in the crooked-keel group there were many cases of perosis and other leg abnormalities. Also, it has been shown that the deposition of Ca in the crooked keel is slower than in the straight keel. Evidently the occurrence of crooked keel and leg abnormalities occurring simultaneously could not be accidental, hence the authors assume that faulty metabolism, manifesting itself as faulty mineral metabolism, is a basic cause for crooked keels and probably has an hereditary origin as suggested by Warren. (1937).—*Authors.* (Biological Abstracts)

CASTILLO, LEOPOLDO S. A STUDY OF THE INFLUENCE OF TWO CHICK RATIONS AND TWO METHODS OF BROODING ON THE RATE OF GROWTH AND MORTALITY OF CHICKS. *The Philippine Agriculturist*, Vol. XXXII, Oct.-Nov.-Dec., 1948, page 124.— The results of the study showed that there was apparently no advantage derived from the use of sun porches over that of the ground runs, for:

A. At the end of the brooding period, the weight difference between the two methods was insignificant.

B. Both the ground-run and sun-porch methods each totaled 87 dead chicks at the end of the brooding period.

C. The sun-porch chicks fed with the College chick ration required 16.5 kilograms more of feed than the ground-run chicks fed with the same ration to produce 100 kilograms of gain, while the sun-porch chicks fed with the imported ration required 12.0 kilograms of feed more than the ground-run chicks to produce 100 kilograms of gain. (Experiment Station Record)

COUCH, J. R., W. W. CRAVENS, C. A. ELVEHJEM, and J. G. HALPIN. *(U. Wisconsin, Madison 6.)* STUDIES ON THE FUNCTION OF BIOTIN IN THE DOMESTIC FOWL. *Arch. Biochem. 21:* 77-86. 1949.— The following functions of biotin as determined with microorganisms were studied using the mature fowl and the developing chick embryo as expl. material: replacement of biotin by oleic acid; citric acid content of bones of 10 day embryos from hens receiving diets adequate and deficient in biotin; CO_2 uptake of normal and biotin deficient day old chicks. Negative results were obtained in each case. When 25 μg. of biotin was injd. at 0 hr. of incubation, normal hatchability was obtained. Hatchability decreased to 0 in almost linear fashion as a similar amount of biotin was injd. up to 120 hr. of incubation. Approximately 10 μg. of biotin was required for hatchability when injd. into biotin-deficient eggs. Curare failed to relieve the ataxia and other symptoms of the deficiency exhibited at hatching time. Only by servering the gastrocnemius tendon could the stiff hocks and flexed toe condition of biotin deficient day-old chicks be relieved. The data indicate that one function of biotin may be related to tendon metabolism in the fowl.—*Authors.* (Biological Abstracts)

CRAVENS, W. W., and J. G. HALPIN. *(U. Wisconsin, Madison.)* THE EFFECT OF PTEROYLGLUTAMIC ACID AND AN UNIDENTIFIED FACTOR ON EGG PRODUCTION AND HATCHABILITY. *Jour. Nutrition 37:* 127-138. 1949.—Four expts. with laying and breeding hens, using purified diets, show the importance of an unindentified factor for hatchability. When sucrose was used as the carbohydrate, hatchability dropped to 0 in from 4-8 weeks. When dextrin was used as the carbohydrate, hatchability was maintained at a higher level but was quite erratic. Fish solubles and liver fraction L prevented the fall in hatchability. Data are presented which indicate that the pteroylglutamic acid (PGA) requirements for the breeding hen are approx. 0.5-1.0 mg./kg. diet. Less than 0.25 mg. was necessary for egg production. The data also indicate that PGA may be synthesized in the intestinal tract of the hen when dextrin is employed as a carbohydrate.—*Auth.* (Wistar Bibl. Serv.).

DANIEL, LOUISE J. and L. C. NORRIS. *(Cornell University, Ithaca, New York).* EFFECT OF OXYTHIAMINE ON THE GROWTH OF CHICKS. *Proceedings of the Society for Experimental Biology and Medicine, 72:* 165, October, 1949.—

Summary. Oxythiamine, the 4'-OH analogue of thiamine, has been shown to be an effective thiamine antagonist in the nutrition of the chick. By increasing the level of oxythiamine fed, the chick weight was decreased until typical thiamine-deficiency symptoms occurred and death ensued. The addition of large amounts of thiamine to the diet prevented the toxicity due to oxythiamine, and the parenteral and oral administration of thiamine to oxythiamine-toxic chicks tended to overcome the inhibition.

The chick, as well as the mouse, has been shown to be very sensitive to the addition of oxythiamine to the diet. It seems probable, therefore, that oxythiamine is an antagonist of thiamine in the nutrition of all species that require this vitamin as an essential nutrient.

Evidence has been presented which indicates that the thiamine requirement of growing White Leghorn cockerels is greater in the absence of sufficient of the unidentified chick growth factors. (Experiment Station Record)

EKMAN, PER, HUGO EMANUELSON, and ALBERT FRANSSON. *(Chemical Institute of the Agr. Coll. of Sweden, and The National Anim. Exp. Sta.)* INVESTIGATIONS CONCERNING THE DIGESTIBILITY OF PROTEIN IN POULTRY. *Ann. Royal Agr. Coll. Sweden, 16:* 749, 1949.

A new method for separating fecal nitrogen from urinary nitrogen is described. The mixed droppings are treated with a moderate excess of oxidizing agent (potassium permanganate) at a medium temperature (50°C) and in nearly neutral aqueous solution. After the uric acid thus has been broken down, the "true protein" is precipitated with uranyl acetate and the amount of N in the precipitate is determined. The method has been tested on mixtures of known proportions of pure feces and urine and the results show, that the fecal N is almost completely accounted for.

Certainly a little part of the fecal N occurs in the form of "amide N", which is not included in the determination of "true protein N", but this loss seems quite well compensated for thereby, that the bird's urine contains a little N of protein nature, which thus arrives in the precipitate. The authors therefore consider, that their direct determination of "true protein N" in the mixed droppings corresponds closely to the "crude protein N" of the feces.

The reproducibility of the chemical analyses is shown to be satisfactory. The loss of fecal N in drying the samples is small, when the drying is carried out rapidly before the hydrolysis of the protein becomes appreciable.

Also concerning the endogenous N the authors describe some trials, which show, that this fraction is fairly large.

The authors emphasize that indirect methods for the determination of fecal nitrogen must be uncertain. Of existing direct methods that of STOTZ seems to be the best, but it is very laborious. The proposed new method is easy to carry out and is proved to be reliable.—*Nils Olsson.*

EMERSON, REBECCA, JEAN HOUSTON, ROLLIN H. THAYER, and ROBERT MacVICAR. *(Oklahoma A. and M. Coll., Stillwater.)* STUDIES ON ALL-VEGETABLE PROTEIN RATIONS. *Poultry Sci. 28:* 431-435. 1949.—The growth promoting value of corn-soy-bean oil meal chick ration was signficantly improved by the addition of B complex vitamins. An additional increase in growth was obtained when this ration was further supplemented with condensed fish solubles, fractions prepd. from condensed fish solubles, whey fermentation solubles or 1:20 liver powder. Antipernicious anemia extracts and prepns. from condensed fish solubles, admd. intramusc. produced comparable growth increases. Casein, alfalfa leaf meal and cereal grass clippings apparently contained limited amts. of the growth-promoting factor. (Biological Abstracts)

FRONDA, F. M., and DOROTEO C. ASUNCION. *(University of the Philippines, College, Laguna).* COW MANURE AS A SUPPLEMENT TO A RATION FOR GROWING CHICKS. *Philippine Agriculturist 32:* 257-260. 1949.

The results of studies to determine the influence of the addition of dried cow manure to the standard ration for growing chicks used in the College of Agriculture, University of the Philippines, were reported in this paper. These results showed that the chicks that received the ration supplemented with one part of cow manure to every ten parts of the ration grew faster and were uniformly heavier than those that did not receive cow manure in the ration. The addition of cow manure to the ration produced weanlings more economical than the standard ration

alone. The addition of cow manure to the ration lowered the mortality of the chicks.—*F. M. Fronda.*

GERICKE, A. M. PEROSIS OR SLIPPED TENDON IN POULTRY. *Farming in South Africa 23:* 268: 481-485. 1948.

This deficiency disease is discussed and reference is made to various minerals and vitamins concerned in the prevention of perosis. Manganese dioxide varying in manganese from 12 to 29 per cent protected chicks against perosis but optimum growth was not secured. In growth studies $MnSo_4$ was more efficient than the dioxide source.—*A. M. Gericke.*

GERICKE, A. M. and H. L. DELPORT. POULTRY RATIONS. *Farming in South Africa 24:* 280: 327-329 and 334. 1949.

It is considered necessary that high maize rations be supplemented with dried brewers yeast, niacin, $MnSo_4$ and $MgSo_4$. The latter mineral is essential if wheaten by-products and meatscraps are excluded from rations. The tendency for birds to eat more mash than scratch grain may result in the consumption of an unbalanced ration. Various recommendations are made to counteract this tendency.—*A. M. Gericke.*

GERMAN, HARRY L. *(A. and M. Coll. Texas),* B. S. SCHWEIGERT *(Amer. Meat Inst. Found., Chicago),* R. M. SHERWOOD, and L. E. JAMES. *(A. and M. Coll. Texas, College Station.)* FURTHER EVIDENCE OF THE ROLE OF LYSINE IN THE FORMATION OF NORMAL BRONZE TURKEY FEATHERS. *Poultry Sci. 28:* 165-167. Illus. 1949.—Broad Breasted Bronze turkey poults were fed a ration low in lysine (0.82% of ration) from day-old to 4 weeks of age. All birds developed white areas in their primary wing feathers. Feather color was then controlled at will by increasing or decreasing the amt. of lysine in the diet. It required 1.2% or more of lysine in the diet to produce normal feather pigmentation.—*Lawrence Morris.* (Biological Abstracts)

GISH, C. L., F. A. KUMMEROW, and L. F. PAYNE. *(Agri. Expt. Sta., Manhattan, Kans.)* CHOLINE AND ETHANOLAMINE REQUIREMENTS IN LAYING RATIONS. *Poultry Sci. 28:* 305-306. 1949. —Approx. 350 New Hampshire pullets, divided into 4 groups, were fed different levels and sources of choline in addition to an otherwise balanced ration for a period of 224 days. The total choline content of the rations were 785, 1285, 1285, and 637 mg. 1 lb. of feed. The 2d and 3d groups were supplemented by adding 50 g. of choline chloride and 50 g. of ethanolamine per cwt., respectively. The latter compound is supposedly at least partially converted by the body into choline. Results indicate that added levels of choline and, or ethanolamine did not benefit egg production, interior quality, storage quality, hatchability, adult mortality, feed consumption, or body wt.—*C. L. Gish.* (Biological Abstracts)

HALPERN, G. R. *(Canadian Fishing Co., Ltd.)* B. MARCH, and JACOB BIELY. *(U. British Columbia, Vancouver.)* STABILITY AND UTILIZATION OF VITAMIN A EMULSIONS IN MIXED FEEDS. *Poultry Sci. 28:* 168-172. 1949.—Using chicks as exptl. animals it was shown that emulsions of Vitamin A and Vitamin A feeding oils, mixed with feed, had the same biological feeding value. This is contrary to earlier work which showed the water emulsion of Vitamin A superior to oil solution of Vitamin A, when fed orally by pipette to chicks. There was no difference in the stability of the water emulsion and oil emulsion when mixed with feeds.—*Lawrence Morris.* (Biological Abstracts)

HEGSTED, DAVID MARK, and THOMAS ROLAND RIGGS. *(Harvard U. Med Sch., Boston.)* THE PANTOTHENIC ACID REQUIREMENTS OF CHICKS RECEIVING A PURIFIED DIET. *Jour. Nutrition 37:* 361-367. 1949.—The min. requirement of pantothenic acid for max. growth of young chicks receiving a purified diet was estimated to be approx. 900 *ug.*/100 g. of diet. Analyses showed that the liver concn. of pantothenic acid was a less sensitive criterion of deficiency than was growth.—*Auth.* (Wistar Bibl. Serv.).

HOIE, JOHS. *(Melding fra Landbrukshogskolens Institutt for Fjorfe og Pelsdyr.)* FORSOK MED LIMVATN TIL KYLLINGER. *Tidsskrift for det Norske landbruk.* No. 1, 1949.

Experiments were carried out on chicks with condensed fish solubles (50% dry matter), obtained in the manufacture of herring meal. The basal ration consisted of ground corn, oats, wheat, barley and soybean meal, linseed cakemeal and minerals. The fish solubles were supplemented in quantities from about 4-9% in weight of the basal ration.

It was found that fish solubles as a supplement to the basal ration resulted in increasing the growth rate of the chicks, which was in agreement with the results found in the U. S.

The chicks supplied with fish solubles also showed better vigor and had better plumage than the control.—*Nils Olsson.*

KRATZER, F. H. *(U. California, Davis.)* THE GROWTH DEPRESSION OF TURKEY POULTS CAUSED BY LINSEED OIL MEAL. *Poultry Sci. 28:* 618-620. 1949.—In 3 expts. turkey poults grew slowly and died when they were fed rations containing 30-47% linseed oil meal. Growth and survival were improved when the linseed oil meal was treated with water or when it was supplemented with pyridoxine. Turkey poults resemble chickens in their response to rations containing linseed oil meal.—*F. H. Kratzer.* (Biological Abstracts)

KRATZER, F. H., D. E. WILLIAM, and BLANCHE MARSHALL. *(U. California, Davis.)* THE SULFUR AMINO ACID REQUIREMENTS OF TURKEY POULTS. *Jour. Nutrition 37:* 377-383. 1949.—Poults were fed from 9 to 14 days on rations in which 24% protein was supplied, principally as isolated soybean protein, with various additions of cystine and methionine. Approx. 0.5% methionine and 0.3% cystine were required for optimum growth. Methionine can completely replace the cystine, but cystine is not changed to methionine.—*Auth.* (Wistar Bibl. Serv.)

KUMMEROW, F. A., R. WEAVER, and H. HONSTEAD. *(Kansas Agric. Expt. Sta., Manhattan.)* THE CHOLINE REPLACEMENT VALUE OF ETHANOLAMINE IN CHICKENS KEPT ON A HIGH FAT RATION. *Poultry Sci. 28:* 475-478. Illus. 1949.—Four groups of 10 chicks each were kept for 10 weeks on a simplified ration which contained 25% protein and adequate amts. of amino acids, minerals and vitamins. The simplified ration of one group was supplemented with 25% ground corn, the other 3 with 25% raw linseed oil. Two of the latter received in addition, at a level of 100 g./100 lbs. ration, either choline chloride or ethanolamine neutralized with HCl. The birds which had been supplemented with 25% linseed oil developed perosis and gained less wt. than those supplemented with 25% corn. The 2 groups which had received choline or ethanolamine in addition to the linseed oil did not develop perosis. The present results seemed to indicate that the choline requirement of chickens, as with rats, is increased in the presence of an excess amt. of dietary fat and that ethanolamine as well as choline is functional under these conditions.—*Authors.* (Biological Abstracts)

HEYWANG, B. W. *(U. S. Dept. Agric., Glendale, Ariz.),* C. A. DENTON, and H. R. BIRD. *(U. S. Dept. Agric., Beltsville, Md.)* THE EFFECT OF THE DIETARY LEVEL OF COTTONSEED MEAL ON HATCHABILITY. *Poultry Sci. 28:* 610-617. 1949.—Data were obtained with White Leghorn pullets receiving 10, 20, or 30% of hydraulic cottonseed meal, or 10, 20, or 30% of solvent cottonseed meal, or 1.25, 2.5 or 3.75% of raw decorticated cottonseed in their diet. The results indicate that 10% of either hydraulic or solvent cottonseed meal may be included in the diets of breeders without impairing the hatchability of their eggs if the meals do not contain more than 0.12% of free gossypol. Inclusion of sardine meal in some of the diets containing the meals or the raw cottonseed at their highest levels did not result in increased hatchability, and inclusion of casein resulted in decreased hatchability. The degree of yolk darkening of eggs held in cold storage for about 6 months increased as the free gossypol content of the diets increased, and hatch-

ability decreased as the degree of yolk darkening increased.—*B. W. Heywang.* (Biological Abstracts)

LEPP, A., A. E. HARPER, and C. A. ELVEHJEM. *(U. Wisconsin, Madison 6.)* CELLULOSE IN PURIFIED DIETS FOR CHICKS. *Poultry Sci. 28:* 372-374. 1949.—Chicks fed diets containing 15 or 18% casein grew slightly better when cellulose was included in the ration. No growth differences were observed in chicks fed basal diets with or without cellulose when the casein level was increased to 22% or when 0.5% methionine was added to the 18% casein diet. Similarly, no growth differences were observed when vitamin C and a higher level of pteroylglutamic acid and certain other vitamins were added to the 22% casein diet.—*C. E. Elvehjem.* (Biological Abstracts)

LILLIE, ROBERT J., and H. R. BIRD. *(U. S. Dept. Agric., Beltsville, Md.)* A BREED DIFFERENCE IN FEATHER PIGMENTATION OF VITAMIN D DEFICIENT CHICKS. *Poultry Sci. 28:* 140, 142. 1949.—Among chicks fed a diet deficient in vitamin D, black feathers were observed in one expt. on all the Rhode Island Red and Buff Orpington chicks but on none of the Buff Rock chicks; and in another expt. on 70.6% of the Buff Orpington chicks and on 37.5% of the Buff Rock chicks. Different strains of the 2 buff breeds were used in the 2 expts.—*H. R. Bird.* (Biological Abstracts)

LINDSTROM, R. G., P. R. MOORE, C. F. PETERSON, and A. C. WIESE. *(Agric. Exp. Sta., Moscow, Idaho.)* ACTIVITY OF A VITAMin B_{12} CONCENTRATE FOR CHICK GROWTH AND HATCHABILITY. *Poultry Sci. 28:* 464-465. 1949.—A vitamin B_{12} concentrate containing 4.4 μg. of B_{12} per g. when fed at a 1% level was as effective in promoting chick growth as 3% condensed fish solubles when added to both synthetic and natural type diets. The vitamin B_{12} concentrate fed at a 1% level to 16 hens whose fertile eggs had previously failed to hatch for a period of 16 weeks increased hatchability to 47, 60, 52, and 68%, respectively, for each of the 4 weeks. 1% of the B_{12} concentrate did not furnish as much of the hatchability factor as 3 or 4.5% herring fish meal.—*R. G. Lindstrom.* (Biological Abstract)

McGINNIS, J. *(State Coll. Washington, Pullman.)* YEAST IN POULTRY DIETS. *Amer. Egg and Poultry Rev. 10:* 58. 1949.—Only a brief summary of the work and results is given on the feeding of *Torula utilis* yeast grown on different agric. wastes. When grown on forest waste and the yeast fed as source of protein in a practical type of diet for older chicks, the growth rate was reduced slightly below that of chicks fed soybean oil meal and fish meal. When grown on pear cannery waste, the yeast proved a good source of riboflavin for turkey poults in addition to being an effective substitute for a relatively large part of the soybean oil meal. When grown on citrus waste, a marked reduction in hatchability of fertile eggs was observed with all treatments in the expt. except where fish meal was used as a supplement to the yeast or to soybean oil meal. The results indicate that yeast is a satisfactory protein concentrate for egg production, but not for hatchability.—*H. G. Lindquist.* (Biological Abstracts)

McKITTRICK, D. S. *(U. California, Berkeley.)* INTERRELATIONS OF CHOLINE AND GLYCINE BETAINE IN THE GROWTH OF THE CHICK. *Arch. Biochem. 18:* 437-448. 1948.—In mildly perotic leghorn chicks fed a diet adequate in S amino acids, the choline required may be divided into an essential and a replaceable part. Essential choline is presumably used in tissue formation and replaceable choline in transmethylation. There is a straight line relation between the essential and replaceable choline required at various growth stages. Close to 0.06% essential choline and 0.14% replaceable choline is required to sustain a growth of 6% per day during the 4th week of life. Replaceable choline can be replaced by glycine betaine; essential choline cannot. The results indicate that the only function of betaine is to replace replaceable choline. In deficiency of choline or of choline plus betaine the

relation of growth to the concn. of the deficient ingredient is that of a 1st order reaction. The essential choline needed to produce a given growth is less in highly than in mildly perotic birds. In such birds total choline chloride in excess of about 0.06% particularly in the presence of betaine depresses growth.—*D. S. McKittrick.* (Biological Abstracts)

MANGELSON, FARRIN L., CARROLL I. DRAPER, DELBERT A. GREENWOOD, and BLISS H. CRANDALL. *(Utah Agric. Expt. Sta., Logan.)* THE DEVELOPMENT OF CHICKS FED DIFFERENT LEVELS OF SUN-CURED AND DEHYDRATED ALFALFA AND THE VITAMIN A AND CAROTENE STORAGE IN THEIR LIVERS. *Poultry Sci. 28:* 603-609. 1949.—A comparison was made by feeding 5, 10, and 15% alfalfa in the diet to Leghorn cockerels and New Hampshire chicks for 8 weeks. Chick mortality was signficantly higher in the 15% dehydrated alfalfa lots. There was a decline of gain in wt. as the quantity of alfalfa was increased. The birds fed dehydrated alfalfa stored vitamin A at a higher level than those fed sun-cured. The New Hampshires stored significantly more vitamin A and carotene in the liver than the Leghorns. —*Authors.* (Biological Abstracts)

MANI, K. V., N. NIKOLAICZUK, and W. A. MAW. *(Macdonald Coll., Quebec.)* FLAXSEED MUCILAGE AND ITS EFFECT ON THE FEEDING VALUE OF LLINSEED OIL MEAL IN CHICK RATIONS. *Sci. Agric. (Ottawa) 29:* 86-90. 1949.—Observations were made on the dietary effect of raw flaxseed mucilage upon growth and condition of chicks and the viscosity of this mucilage following different treatments. An attempt was made to correlate the results obtained with the effect of drying temp. on the feeding value of water treated linseed oil meal. It is concluded that flaxseed mucilage, when incorporated into a chick starter ration at levels approximating 18% linseed meal, has a growth-depressing effect on chicks and causes the development of beak necrosis. The viscosity of aqueous solns. of flaxseed mucilage is appreciably reduced by autoclaving and by drying at 80°C and to a lesser extent by holding at room temp. for 24 hrs. Higher drying temps. applied to water treated linseed oil meal likewise showed greater beneficial effect based on chick response. It is therefore suggested that the presence of mucilage in linseed oil meal is one of the factors involved in the low feeding value of the latter for chicks and that the improvement in the meal as a result of higher drying temps. in the water treatment process is partly due to alteration in physical properties, notably viscosity, of the mucilage.—*N. Nikolaiczuk.* (Biological Abstracts)

MANI, K. V., N. NIKOLAICZUK, and W. A. MAW. *(Macdonald Coll., Quebec.)* CYANOGENETIC GLUCOSIDES AND TDYPSIN INHIBITORS IN LINSEED OIL MEAL. *Sci. Agric. (Ottawa) 29:* 91-95. 1949.—Chemical and biological studies which were designed to correlate the presence of HCN with depression of chick growth by linseed oil meals proved negative. Raw and autoclaved aqueous extracts of both linseed oil meal and flaxseed had little influence on tryptic hydrolysis of casein which suggests that trypsin inhibitors are not present in these extracts to any appreciable extent. It is concluded that the observed toxic effect of linseed oil meal in chick rations is due primarily to factors other than cyanogenetic glucosides and trypsin inhibitors.—*N. Nikolaiczuk.* (Biological Abstracts)

MILLIGAN, J. L., and G. M. BRIGGS. *(U. Maryland, College Park.)* REPLACEMENT OF PANTOTHENIC ACID BY PANTHENOL IN CHICK DIETS. *Poultry Sci. 28:* 202-205. 1949.—A study was undertaken to determine if panthenol could be substituted for pantothenic acid in chick nutrition, and if so, to determine the relative activity of the alcohol compared with pantothenic acid. New Hampshire chicks were fed a synthetic type ration virtually devoid of pantothenic acid and graded amts. of either the vitamin or its alcohol derivative were added to the feed for different groups. The growth response of the chicks fed or injd. subcut. with panthenol showed that this compound may be totally substituted for pantothenic acid when admd. either orally or subcut. and that the alcohol

derivative is about 60% as active as pure pantothenic acid for growth of the chick.—*J. L. Milligan.* (Biological Abstracts)

MOREHOUSE, NEAL F. *(Dr. Salsbury's Labs., Charles City, Ia.)* WATER CONSUMPTION IN GROWING TURKEYS. *Poultry Sci. 28:* 152-153. 1949.—Mean daily water consumption in 4 groups of 35 turkeys each is tabulated by weekly intervals from 1 to 26 weeks of age. Data for an additional group of 25 poults are given for the first 13 weeks. All turkeys were raised in complete confinement.—*N. F. Morehouse.* (Biological Abstracts)

MOREHOUSE, NEAL F. *(Dr. Salsbury's Labs., Charles City, Iowa.)* ACCELERATED GROWTH IN CHICKENS AND TURKEYS PRODUCED BY 3-NITRO-4-HYDROXYPHENYLARSONIC ACID. *Poultry Sci. 28:* 375-384. 1949.—The arsenic compound, 3-nitro-4-hydroxyphenylarsonic acid, accelerated the growth rate of young chickens when admd. within a drinking water concn. range of 0.000066 to 0.005125% or a feed concn. range of 0.000661 to 0.009259%. Optimum concns. in the drinking water and feed were approx. 0.0025 and 0.009%, respectively. A similar effect was obtained on the growth of turkeys, the stimulation being greater when the treatment was given during the early part of the growing period than during the later part. Treated turkeys showed better feed utilization than the controls. Treated New Hampshire pullets showed a tendency toward heavier wt. at the time the first egg was laid. The mean age at the first egg in 6 treated groups was 2 to 24.5 days (avg. 15.1 days) less than that of their respective controls.—*N. F. Morehouse.* (Biological Abstracts)

OLSSON, NILS. *(The National Anim. Exp. Sta., The Royal Agr. Coll. of Sweden.)* INVESTIGATION ON THE VITAMIN D REQUIREMENTS OF CHICKS, POULTS, DUCKLINGS AND GOSLINGS. *The Annals of the Royal Agr. Coll. of Sweden, 16,* 1, 1949.

Investigations have been carried out on the vitamin D requirements of chicks, poults, ducklings and goslings. The vitamin D content of the cod liver oil used has been tested against crystalline vitamin D_3 of which 0.01 gamma was equivalent to the effect of 1 Chick Unit (= 1 A.O.A.C. unit). The vitamin D content of the cod liver oil was 180 Chick Units per gram.

In White Leghorn chicks the requirements of vitamin D was found to be 250-300 Chick Units per kg. of feed containing about 1.65% Ca and 0.7% P. Rhode Island Red chicks were found to have about 2.7 times the vitamin D requirements of White Leghorn chicks. This result agrees with the earlier finding of the author (Olsson 1941).

White Sussex chicks were found to have about 1.6 times the vitamin D requirements of the White Leghorns. A great individual variation in vitamin D requirement was found within the breeds.

In White Leghorn chicks the requirements of vitamin D_3 was found to be 2,000-2,500 I.U. per kg. of feed containing about 1.65% Ca and 0.7% P.

White Holland poults on a diet containing about 1.5% Ca and 0.72% P required about 700-800 Chick Units of vitamin D per kg. of feed in the absence of antirachitic light.

The difference between the effect of 1 Chick Unit of cod liver oil vitamin D and 1 I.U. of vitamin D_3 seems to be just as great in turkeys as in chickens.

In Peking ducklings reared in cages in the absence of antirachitic light the requirement of vitamin D was found to be about 800 Chick Units per kg. of feed containing 1.6-2.0% Ca and 0.8-1.0% P.

In White Italian goslings, reared in cages and in the absence of antirachitic light the requirement of vitamin D was found to be about 300 Chick Units per kg. of feed containing 2.02% Ca and 1.01% P in the dry matter for proper growth and bone calcification. Toulouse goslings and other goose breeds with high growth rates required, under the same conditions, at least 350 Chick Units of vitamin D per kg. of feed.

Great differences occurred between the vitamin D requirement of individual goslings owing, apparently, to variations both in rearing con-

ditions and, probably, in heredity.

Calcification of the tarso-metatarsal bones was completed in geese and ducks at about 8 weeks of age after hatching. The same degree of tarso-metatarsal bone calcification was found in chickens and turkeys at about 16-24 weeks of age after hatching.—*Nils Olsson.*

PENSACK, J. M., R. M. BETHKE, and D. C. KENNARD. *(Agric. Expt. Sta., Wooster, Ohio.)* SOME PROPERTIES OF AN UNIDENTIFIED GROWTH FACTOR PRESENT IN FISH PRODUCTS. *Jour. Nutrition 37:* 353-360. 1949.—In chick tests the essential chick growth factor in sardine fish meal and condensed fish solubles was found to be: soluble in 75% acetone and in 80% ethanol; insoluble in n-butanol; adsorbable on Darco G-60 at pH 3 from a water soln., but not adsorbable by Darco G-60 from an 80% ethanol soln. The factor (or factors) was eluted from Darco G-60 with 10% ammonium hydroxide in 95% ethanol with about 20% loss in activity; the solns. were colorless.—*Auth.* (courtesy Wistar Bibl. Serv.).

PENSACK, J. M., R. M. BETHKE, and D. C. KENNARD. *(Agric. Expt. Sta., Wooster, Ohio.)* THE EFFECT OF FISH MEAL AND EXTRACTS OF FISH MEAL ON HATCHABILITY OF HENS' EGGS AND GROWTH OF PROGENY. *Poultry Sci. 28:* 398-405. 1949.—Two expts. with hens showed that a diet of yellow corn, oats, wheat by-products, dehydrated alfalfa meal, soybean oil meal, minerals, and adequate vitamins A, D, and riboflavin is deficient in a factor essential for good hatchability. The essential hatchability factor was present in sardine fish meal and was soluble in 80% hot ethanol and was adsorbed by Darco G-60 at pH 3 from a water soln. of an ethanol extract of fish meal but was not adsorbed at pH 3 from an 80% ethanol soln. of a similar extract. The sardine fish meal contained a growth factor (s) which was transmitted from the hen through the egg to the chick. The growth factor which was transmitted to the chick by the hen was soluble in 80% hot ethanol and was adsorbed from a water soln. of 80% ethanol soluble fish meal by Darco G-60 at pH 3. A supplement of 2%-6% sardine fish meal to the hens' diet permitted storage in the egg of an unidentified growth factor (s) which increased the rate of growth of the progeny but which was not sufficient to meet the chick's maximum need to 6 weeks of age. 6% fish meal in the hen diet caused a greater storage in the chick of the unidentified growth factor (s) than a supplement of 2% sardine fish meal. The relationship between the hatchability factor and the chick growth factor (s) in sardine fish meal is discussed.—*J. M. Pensack.* (Biological Abstracts)

RAU, GERARD J. *(U. Maryland, College Park),* and C. S. PLATT. *(Agric. Expt. Sta., New Brunswick, N. J.)* THE EFFECT OF SIZE OF LIMESTONE GRIT PARTICLES IN POULTRY RATIONS. *Poultry Sci. 28:* 232-235. 1949.—Limestone as the sole supplemental source of Ca was added to an all-mash ration for laying fowls in 3 different forms, the small (chick) size, the large (hen) size, and powdered. No other type of grit was fed. In each instance the amt. of the limestone product added was 3% of the mash, by wt. White Leghorn pullets hatched in May were placed on the exptl. diets Nov. 27 and continued for 48 weeks, 40 birds on each diet. Egg shell breaking strength was measured at 4-week intervals and eggs were set at 3 times during the spring to test hatching quality. The size of the limestone supplement used had no significant effect upon egg production, egg shell strength, hatchability, feed consumption, body wt., or mortality, thus indicating that the use of the coarser particles of limestone resulted in as even a distribution of Ca throughout the flock as when the limestone was supplied in powdered form, even though both were mixed in the feed at the same level.—*C. S. Platt.* (Biological Abstracts)

REYNIERS, J. A., T. D. LUCKEY, P. C. TRUXLER, R. F. ERVIN, M. WAGNER, and H. A. GORDON *(Notre Dame, Indiana):* R. A. BROWN, G. J. MANNERING, and C. J. CAMPBELL. GERM-FREE CHICK NUTRITION: DEVELOPMENT ON SYNTHETIC-TYPE DIETS. *Fed. Proc. 8:* 393. 1949.—*An abstract.* (Biological Abstracts)

RICHARDSON, L. R., L. G. BLAYLOCK, H. L. GERMAN, and R. M. SHERWOOD. *(Texas Agric. Expt. Sta., College Station, Texas.)* AMINO ACIDS AND VITAMIN B_{12} AS SUPPLEMENTS TO PLANT PROTEINS FOR GROWING CHICKS. *Fed. Proc. 8:* 393. 1949.—*An abstract.* (Biological Abstracts)

SAHYUN, MELVILLE. THE NUTRITIONAL SIGNIFICANCE OF METHIONINE AS ILLUSTRATED IN POULTRY. *Texas Repts. Biol. and Med. 6:* 475-485. 1948.—To supply the chickens and eggs consumed annually in the U.S.A. requires raising over 37 billion lbs. of feed. Since poultry require a complicated and exacting mixture of nutrients, their nutrition is a problem of great practical importance. Partial dietary deficiencies, are not readily recognized, must be avoided. A survey indicates that methionine may not be present in adequate amounts in poultry diets. This has been confirmed by the recent nutritional studies of J. Johnson (Dow Chem. Co.), e.g., who found that 3.4 lbs. of an excellent feed mixture were required to produce 1 lb. of meat, but that when this diet was supplemented with 0.1% methionine, only 2.8 lbs. of feed would suffice.—*A. A. Ormsby.* (Biological Abstracts)

SCOTT, M. L. *(Cornell Univ., Ithaca)* "HIGH EFFICIENCY" TURKEY RATIONS SPEED GROWTH. *Farm Research*, Geneva, N.Y., October, 1949, XV: 16.

The poult has a critical need for at least two unidentified vitamins. One of these factors is known to be present in products of animal origin. The other factor, which the Cornell poultry nutritionists are tentatively calling factor S, is present in dried skimmilk, dried brewers' yeast, and distillers' solubles. A higher-energy and higher-protein starter, provided that it also contains all of the various nutrients listed, promotes a more rapid and uniform early growth in poults.

Approximate Nutritional Requirements of the Turkey Poult

Nutrient	*Amount required*
Protein (percent)	28
Arginine (percent)	1.35
Lysine (percent)	1.3
Methionine (percent)	0.5
Cystine (percent)	0.3
Glycine (percent)	0.9
Calcium (percent)	1.5
Phosphorus (percent)	0.9
Manganese (ppm)	50
Vitamin A (units/lb.)	4,000
Vitamin D (units/lb.)	800
Riboflavin (mg./lb.)	2
Niacin (mg./lb.)	22.5
Choline (mg./lb.)	900
Folic acid (mg./lb.)	0.5
Pantothenic acid (mg. lb.)	5.0
Pyridoxine (mg. lb.)	1.5

(Experiment Station Record)

SCOTT, M. L. *(Cornell U.)*, and R. E. REYNOLDS. *(New York State Game Farm, Ithaca.)* STUDIES ON THE NUTRITION OF PHEASANT CHICKS. *Poultry Sci. 28:* 392-397. 1949.—A pheasant chick diet has been formulated which has produced uniform growth, freedom from bone deformities, and freedom from perosis in several feeding trials. While this diet does not completely prevent feather-picking under all conditions, evidence is presented that the addition of Mg to the diet may improve it in that respect. The results presented indicate that the requirements of the pheasant for energy and for unidentified vitamins are not as high as those for turkey poults.—*M. L. Scott* (Biological abstracts)

SERFONTEIN, P. J. BLOODMEAL IN POULTRY RATIONS. *S. Africa Dept. of Agric. Bull. 280:* 1.21. 1947.

In a series of experiments the value of bloodmeal as a source of animal protein has been investigated. The results reveal that there was

no difference in the nutritive value of different kinds of bloodmeal manufactured under different processes by various municipalities. In chick rations, 25% of white fish-meal or meatmeal protein could be replaced by bloodmeal. Chick rations supplemented with white fishmeal and bloodmeal gave better results than a combination of meatmeal and bloodmeal. Maize germmeal had a higher supplementary value to bloodmeal than groundnut oil cake meal. In the various chick experiments biotin deficiency was more common than other deficiency diseases. Cannibalism was particularly severe in laying hens fed a ration supplemented with bloodmeal.—*A. M. Gericke.*

SERFONTEIN, P. J. THE FEEDING OF POULTRY DURING THE WAR. *Farming in South Africa 23:* 269: 560-569. 1948.

Reference is made to the important discoveries in the field of poultry nutrition from 1918 to 1939. During the war period the consumption of balanced feed increased from 12,000 tons in 1939 to 30,000 tons in 1946. Groundnuts are produced on a large scale in this country and the oil cake meal may in future replace the major portion of the protein in poultry rations. Other countries are in a more fortunate position because large quantities of soybean oil cake meal are available. Various sources of vitamins necessary for the prevention of deficiency diseases are referred to.—*A. M. Gericke.*

SERFONTEIN, P. J. and C. L. MARAIS. THE REARING OF CHICKENS. II. THE FEEDING OF CHICKENS. *Farming in South Africa 24:* 282: 403-409. 1949.

The nutritive requirements of chicks are given together with photos illustrating various deficiency diseases.—*A. M. Gericke.*

SKOGLUND, W. C., A. E. TOMHAVE, and C. W. MUMFORD. *(Agric. Expt. Sta., Newark, Del.)* CAROTENE FROM VEGETABLE LEAF WASTES COMPARED WITH VITAMIN A IN LAYING RATIONS. *Poultry Sci. 28:* 298-300. 1949.—In a series of tests using a carotene concentrate in comparison with distilled Vitamin A esters, the results indicate a trend for the hens in the Vitamin A-fed pens to produce more eggs than the hens fed the concentrated carotene, but the difference was small. There was no difference in feed consumption between the 2 pens fed the 2 types of feed. Mortality and hatchability were essentially the same for all lots. In most cases the carotene from dehydrated vegetable waste in the form of a concentrate is as efficient as Vitamin A esters from fish liver oil.—*Lawrence Morris.* (Biological Abstracts)

TEMPERTON, H., and F. J. DUDLEY. *(Nation. Inst. Poultry Husbandry, Shropshire, Eng.)* THE EFFECTS OF SYSTEMS OF FEEDING ON GROWTH AND EGG PRODUCTION. V. A COMPARISON OF CONTROLLED AND UNRESTRICTED DRY MASH, WET MASH AND PELLET FEEDING FOR LAYING PULLETS. *Harper Adams Utility Poultry Jour. 33:* 37-45. 1948.—Pullets were continued during the laying yr. on the same system of feeding as during the rearing period. The rations were fed to the different groups in laying batteries as dry mash, wet mash and pellets in restricted amounts and ad libitum. The differences in egg production were attributed to the method of feeding and not to the differences in feed consumption. The avg. egg production for the wet mash groups was significantly lower than that for the remaining groups. Likewise the number of eggs produced per lb. of feed consumed was significantly lower for the wet mash groups. Body wt. was not related to the method of feeding. Mortality was higher among the wet mash groups than among the other groups.—*T. B. Clark.* (Biological Abstracts)

TOTTER, JOHN R. *(U. Arkansas Sch. Med., Little Rock),* WILLIAM E. MARTINDALE, MARION McKEE, CECILIA K. KEITH, and PAUL L. DAY. BIOCHEMICAL STUDIES OF CHICKS RECEIVING GRADED LEVELS OF PTEROYLGLUTAMIC ACID. *Proc. Soc. Exptl. Biol. Med. 70:* 435-438. 1949.—Detns. of desoxypentose and pentose nucleic acids, pteroylglutamic acid (PGA) and conjugases were made on

the livers of chicks receiving 0, 5, 10, 20, 40, 80, 200 and 1000 μg. of PGA per 100 g. of purified diet and on controls receiving a commercial diet. Desoxypentose nucleic acid was low (2.5 mg./g.) in the negative control group as compared with the values found for all other groups (2.9-3.5 mg./g.). Differences between the groups receiving various levels of PGA were not significant. The pentose nucleic acid was found to average 6.0 mg./g. in the deficient group while it ranged from 6.5 to 7.0 mg./g. in the other groups. The liver conjugase levels were unrelated to the PGA intake. Total liver PGA was found to be 2.1, 1.5, 3.1, 3.2, 3.2, 9.9, 6.3, 8.9, and 7.3 μg./g., respectively, for the above groups.—*J. R. Totter.* (Biological Abstracts)

TYLER, CYRIL. *(U. Reading, Eng.)* THE MINERAL REQUIREMENTS AND METABOLISM OF POULTRY. CALCIUM AND PHOSPHORUS. II. *Nutrition Abst. and Rev. 18:* 473-483. 1949.—In a continuation of this review the author discusses bone salts and their mobilization, including hormonal effects; egg shell formation; egg shell characteristics, such as shell thickness and porosity; and egg composition and changes during hatching, as revealed, for example, by studies with phosphorus isotopes. 87 references to the literature are cited. The author believes that laying birds can readily deposit or withdraw minerals from the bones, the process being goverened partly by the action of estrogens and possibly androgens, as well as by parathormone. The role of carbonic anhydrase in shell secretion is emphasized, and the effect of diet and sulfa drugs on shell formation and characteristics is discussed. The need for additional work on the absorption and excretion of Ca and P, the formation and structure of the egg shell, and the changes that occur in egg composition are pointed out.—*H. H. Mitchell.* (Biological Abstracts)

WILCKE, HAROLD L. ANIMAL PROTEIN FACTORS. *Flour & Feed, 50:* 28 ,October, 1949.

This group of factors is recognized as a part of the vitamin B complex. At least three separate vitamins in this group have been demonstrated, and there may be more. The three I am referring to are vitamin B_{12}, the "whey factor" of Hill, and vitamin B_{12}, which seems to be at least a part of the "intrinsic factor" of Castle.

Vitamin B_{12} was isolated and identified by two laboratories at about the same time—the Merck Laboratories in this country, and the Glaxo Laboratories in England. They found that they had a red, crystalline substance containing both phosphorus and cobalt, which was very effective in the treatment of pernicious anemia in humans, particularly when used in conjunction with folic acid, and more recently, when used with B_{12}. This same material was found to stimulate growth in chicks when used at very small levels, such as 6 to 30 parts per billion of diet.

As sources of the animal protein factors, which include vitamin B_{12}, we have many products. Chief among those are good quality fish meal, fish solubles, meat scrap, milk products and liver meal; but while this group of vitamins belongs to the B complex, it is different from the other B vitamins in one respect—it is not found in important quantities in yeast. Therefore, those who have been using fish meal, fish solubles, and meat scraps in their rations for livestock and poultry in the past have been supplying the animal protein factors. (Experiment Station Record)

ANIMAL PROTEIN FACTOR. *Flour & Feed, 50:* 38, October, 1949. —In brief, here are the functions of the animal protein factor with regard to animals and poultry.

1. It is necessary for the proper utilization of proteins.
2. It is necessary for rapid optimal growth of chickens and hogs.
3. It provides for greater hatchability of eggs.
4. It helps to overcome high chick mortality.

(Experiment Station Record)

POULTRY; VITAMIN B_{12} MAY RESULT IN SIMPLIFIED, CHEAPER FAST-GROWING RATIONS.—*Agricultural Research in Idaho,* Fifty-Sixth Annual Report, year ending June 30, 1949, Bulletin

No. 276, page 59.—More recent work suggests the possibility that this vitamin may replace the need for a number of costly ingredients in present high-energy low-fiber fryer rations. In the past it has been found necessary to use fish meal, meat meal, liver meal, and other costly concentrates. Table 15 shows the results obtained with the addition of a concentrate of vitamin B_{12} to a simple ration containing only corn, soybean oil meal, dehydrated alfalfa meal, minerals, and vitamin D. This data would indicate that the addition of this vitamin was as effective in promoting rapid growth as the use of high cost, scarce products such as fish meal and liver meal. (Experiment Station Record)

POULTRY; WHOLE OATS IN SELF-FEEDERS MAY CUT MASH CONSUMPTION AND REDUCE PROFITS. *Agricultural Research in Idaho*, Fifty-Sixth Annual Report, year ending June 30, 1949, Bulletin No. 276, page 61.

Feeding whole oats, continuously available in self-feeders, resulted in reduced mash consumption in each pen where the practice was used. Instead of the usual ratio of mash consumption of about 50 percent of total feed, the proportion was reduced to 34 and 35 percent. The amount of whole oats eaten from self-feeders amounted to 19 and 20 percent of total feed consumed. Obviously, when the consumption of mash is reduced, the percent protein of total feed is likewise reduced. It will be noted that egg production over the 10-month period was reduced by approximately five eggs per bird and that this resulted in a reduction of 27 cents in the income per bird over feed cost. (Experiment Station Record)

PATHOLOGY

BELL, A. E. PHYSIOLOGICAL FACTORS ASSOCIATED WITH GENETIC RESISTANCE TO FOWL TYPHOID, *The Journal of Infectious Diseases, 85:* 154, September-October.

Resistant strains of chicks possessed higher normal body temperatures during the test period, 9 to 23 days of age. Following inoculation at 10 days of age this higher temperature was maintained for a period of 3 to 4 days, the normal incubation period for fowl typhoid.

Artificially reduced body temperatures lowered resistance in all strains below that of corresponding controls. Resistant chicks were more nearly able to maintain normal body temperature under adverse conditions indicating a more efficient temperature-regulating mechanism. (Experiment Station Record)

BOTTORFF, C. A. MEGASUL IN CONTROL OF COCCIDIOSIS. *American Egg and Poultry Review*, Vol. 10, No. 10, October, 1949, page 42.

The long-term continuous low-level administration of effective drugs is now considered a practical method of preventing coccidiosis. Megasul Nitrophenide (m,m-dinitrodi-phenyldisulfide) *Lederle* is a promising new type of anticoccidial agent for this means of control.

Megasul is not a sulfa drug but is another type of organic compound. It is not related to nitrofurazone compounds.

At the Conference on Coccidiosis, New York Academy of Sciences, 1949, it was reported that Megasul, fed at levels of 0.01 to 0.0125% in the feed reduces oocyst production and that, of those oocysts that are produced, only about 40 percent sporulate. Therefore, continuous feeding at the recommended levels keeps the number of oocysts in the litter below lethal numbers while permitting the mild infections necessary for acquired immunity.

Megasul is available to feed manufacturers as a 25% premix with soybean meal for easy incorporation in poultry mashes. One pound mixed with one ton of mash will give a concentration of one-quarter pound of Megasul (0.0125%) per ton of mash. (Experiment Station Record)

CHUTE, H. L. AN OUTBREAK OF PSEUDOMONAS INFECTION IN POULTS. *Canadian Jour. Comp. Med. 13:* 112-115. 1949.—Report of an outbreak of infection with *P. aeruginosa* in 87 white Holland poults. A few died daily until the mortality in the first 3 weeks rose to 68. Symptoms were staggering gait, drooping wings, and foamy diarrhea. There was fluid in the abdominal cavity, gelatinous exudate under the skin, pale liver, and inflammation of the intestines with some petechial hemorrhages. The isolated organism corresponded with the description in Bergey's Manual. The peak period of mortality was passed before the diagnosis was made and no treatment was attempted.—*Ronald Gwatkin.* (Biological Abstracts)

CORONEL, ANACLETO B. *(Bureau of Animal Industry, Manila, Philippines).* NEWCASTLE DISEASE IN THE PHILIPPINES WITH SPECIAL REFERENCE TO IMMUNIZATION. *Philippine Journal of Animal Industry 10:* 3-15. 1949.

A report of the origin, spread, and extent of infection of Newcastle disease in the Philippines, and of the efforts exerted in its control. Immunization studies were tried with tissue vaccine from infected fowls, with immune and super-immune sera, with vaccine from virus cultured in vitro and with tissue vaccines from embryo cultured virus. The cultivation of the virus in highly concentrated form by the use of the egg technique led to the production of more satisfactory products, the crystal-violet-formol vaccine and the adsorbate vaccine, the latter proving to be a more superior product as shown both by laboratory and field tests. —*F. M. Fronda.*

EWING, RAY. LEG WEAKNESS IN FOWLS. *Flour & Feed, 50:* 43, October, 1949.

Turkeys in some areas have developed a leg weakness after 10 to 12 weeks of age. The symptoms appeared in spite of the fact that they were being fed a well fortified growing mash in addition to grains. In most instances the trouble was traced to a low intake of vitamin fortification and minerals because of the high percentage of grain fed. The calcium-phosphorus level and balance in some of these cases was too low resulting in poor skeletal development. Feed that had been stored for long periods was found to be the cause of low vitamin fortification in some flocks which caused leg weakness, particularly in the latter stages of the feeding period. Feed should always be fed as fresh as possible.

Perosis in a flock of turkeys is usually observed first when the owner notices that some of the heavier tom turkeys spend a lot of time sitting down. When forced to get up they do so slowly and soon sit down again. Sore feet generally is suspected at first. These are usually the first symptoms of perosis, and if remedies can be applied at this time in the form of abundant fresh green feed, the crippling effect can be overcome, and losses may be avoided. Another peculiar condition in turkey poults is a type of leg weakness showing no swollen joints or perosis or twisted legs. Investigators found the turkeys heavily infested with a fowl malaria which is caused by a parasite. Part of the life cycle of the parasite is spent in the lining of the blood vessels and intestines and greatly inhibits the bird's ability to assimiliate the nutrients in the feed. (Experiment Station Record)

HAYS, F. A. *(U. Massachusetts, Amherst.)* MORTALITY IN THE LAYING HOUSE. *Poultry Sci. 28:* 146-147. 1949.—The monthly mortality rate was recorded for 8 generations including 3925 R. I. Red pullets for their 1st laying year. The mean annual rate was 26.42%, the max. for any one yr. was 46.49% and the min. was 18.27%. The data showed that the mortality rate was at a low level for the first 3 months. After this there was a rather rapid increase to a max. during June. July, Aug. and Sept. each exhibited a significant decline. Major causes of death in June fell in the category of kidney and reproductive disorders. —*F. A. Hays.* (Biological Abstracts)

JUNGHERR, ERWIN, ROY E. LUGINBUHL, and LAWRENCE KILHAM. SEROLOGIC RELATIONSHIPS OF MUMPS AND NEW-

CASTLE DISEASE. *Science*, September 30, 1949. 110: 333.

The reactions may be due to non-specific serum factors arising as result of infection rather than to specific antibodies. If the factors are actually antibodies, their presence would support the hypothesis that NDV and mumps virus are closely related. (Experimental Station Record)

SALAFRANCA, E. S., and J. D. GENEROSO. *(Bureau of Animal Industry, Manila, Philippines).* FOWL-POX VACCINE FROM FOWL-POX VIRUS CULTIVATED ON THE CHORIOALLANTOIC MEMBRANES OF DEVELOPING EGGS. *Philippine Journal of Animal Industry 10:* 125-141. 1949.

A description is given of the technique for the isolation of the fowl-pox virus, as well as for the inoculation of the egg. A tabulated summary of the typical passages, series A, collateral passages and passage in alien egg has also been presented together with tests of the vaccine prepared from the 2nd to 7th transfers and from the 10th to the 17th transfers of series A. Some of the vaccines prepared and which have proved potent in the tests have been dispensed and distributed for use in disease control work.—*F. M. Fronda.*

STURKIE, PAUL D. *(Agric. Expt. Sta., New Brunswick, N. J.)* THE ELECTROCARDIOGRAM OF THE CHICKEN. *Amer. Jour. Vet. Res. 10:* 168-175. 1949.—Three to 6 ecg's. per bird were run on 72 White Leghorn hens over a year period. Variations in heart rate, intervals of time, amplitude and electrical axes were studied. The results show that heart disorders as revealed by the ecg. accounted for few, if any, deaths of birds during the test period of 1 yr. 15% of the birds dying during the period exhibited abnormal or unusual ecg's. Death of only one of these birds was thought to be due to the abnormality, and that is questionable. Approx. 29% of the birds surviving the test period exhibited abnormal or unusual ecg's. These are described and discussed. The ecg. of lead I of the normal bird is the most variable of the limb leads. Lead I exhibits several types of configurations with respect to R and S, but there are 2 main types, A and B, which are described. 18% of the birds studied exhibited lead I's of A type, and 63% showed Type B. About 18% showed lead I's in which the R's and S's were of about equal prominence. The heart rates varied from 180 to 340, with a mean of 279. For ecg's. showing Type A lead I (RS II greater than RS III), the avg. RS electrical axis was -102.11°; and for those showing Type B lead I, the avg. axis was -74.04°. The avg. T axis for the ecg's. with a positive T I (T II exceeds T III) was +81.8°. For the tracings with a negative T I (T III exceeds T II) the avg. axis was +100.3°.—*P. D. Sturkie.* (Biological Abstracts)

TODD, A. C., W. M. INSKO, JR., G. W. KELLEY, and M. F. HANSEN. AGGREGATE WORM INFECTIONS AND GROWTH OF BROILERS. *Transactions of the American Microscopical Society,* LXVIII: 256, July 1949.

There are reported the amounts of weight gained in 3-week test periods by New Hampshire broilers following direct exposure to infective eggs of *Ascaridia galli* (Schrank, 1788), or to infective eggs of *Heterakis gallinae* (Gmelin, 1790), or to infective eggs of both species. Progressive retardation of growth occurred as the number of species of worms constituting the infections increased. The data indicate that effects of parasites upon their hosts are dependent upon the aggregate number of species present. (Experiment Station Record)

WHEELER, ROBERT S. and EDMUND HOFFMANN. GOITEROGENIC ACTION OF IODIDE AND THE ETIOLOGY OF GOITERS IN CHICKS FROM THYROPROTEIN-FED HENS. *Proceedings of the Society for Experimental Biology and Medicine, 72:* 250, October, 1949.

Summary. The goiterogenic action of increased iodide intake is demonstrated both in the normal fowl, following continuous treatment, as well as in the developing chick embryo. The goiters in chicks pre-

sumably result from large amounts of inorganic iodide deposited in the egg by the hen and are comparable in weight and histology to those observed in chicks from dams fed synthetic thyroprotein. It is suggested that the goiters observed in chicks from dams fed synthetic thyroprotein are caused by the iodide present in thyroprotein. (Experiment Station Record)

POULTRY PRODUCTS AND MARKETING

ANTONIANI, CLAUDIO, LINDA FEDERICO, and MARCELLO MISSIROLI. *(Expt. Sta. for the Cold, Milan.)* LE VARIAZIONI DI CONTENUTO VITAMINICO NELLE UOVA CONSERVATE MEDIANTE IL FREDDO. [VARIATIONS IN THE VITAMIN CONTENT IN COLD PRESERVED EGGS.] *Ann. Sperim. Agrar.* [*Rome*] 2: 481-488. 1948.—The influence of different methods of preserving eggs on their content in vits. B_1, B_2, D_2 and E was investigated by: (1) immersion in a saturated soln. of $Ca(OH)_2$ at 2-3°C; (2) refrigeration at 0°C with an air humidity of 80%; (3) "Stabilization", a method consisting in keeping the eggs in an atmosphere composed of 95% N and 5% CO_2 at a pressure of 250 mm. of water and at a temp. 1°C. Vit. contents were determined after 50 days of preservation. With the first method (lime) the vit. B_1 content was practically unaltered, vit. B_2 content was reduced by 20%, vit. E content by 50% while vit. D was only slightly affected. With the 2d method (refrigeration) amts. of vit. B_1 and B_2 were slightly reduced, vit. E content was half of that observed at the beginning vit. D content was not altered. With the 3d method (stabilization) vit. B_1 diminished slightly, vits. B_2 and D_2 were not affected, vit. E content was half of that registered at the beginning of the expt.—*W. Bally.* (Biological Abstracts)

ANTONIANI, CLAUDIO, and RENE MARIA CIOFFI. *(Expt. Sta. of the Cold, Milan.)* LA DIMINUZIONE DELLA DIGERIBILITA TRIPSINICA IN VITRO NELL'ALBUME DELLE UOVA CONSERVATE MEDIANTE REFRIGERAZIONE. [*THE DIMINUTION OF DIGESTIBILITY OF THE WHITE OF FROZEN EGGS AFTER ADDITION OF TRYPSIN TESTED IN VITRO.*] *Ann. Sperim. Agrar.* [*Rome*] *2:* 397-405. 1948.—With a view of studying the influence of different preservation methods, the authors determined changes in the digestibility of egg white by analyzing whites of fresh eggs and of eggs preserved with different preservation methods after 8, 24, 32, 48, 72 and 96 hrs. After addition of 50 cc. of a phosphate buffer at pH 8 and of 0.5 g. of trypsin, 10 g. of egg white were reduced to a volume of 250 cc., then 2 cc. of toluidine were added. The control as well as the expt. test tubes were kept in a thermostat at 38°C. In one series of controls no trypsin, in the other no egg white was added. A fraction of the albumen was employed for the detn. of the moisture content, the other fraction for determining the total N content with the Kjeldahl method. Amine N was determined at different times with the method of van Slyke. The following groups were studied: (1) fresh eggs; (2) eggs kept for 4 mos. in a laboratory refrigerator at 0°C; (3) eggs preserved for 7 mos. following the Lescarde-Everaert method, in an atmosphere composed of 95% N and of 5% CO_2 at 1°C; (4) eggs kept during the same period in a saturated soln. of $Ca(OH)_2$ at 4-5°C. If the digestibility limit after 96 hrs. of trypsin action is taken 100, percentages of this value are 73 in expt. (2), 28 in expt. (3), and 22 in expt. (4). The diminution in digestive activity of trypsin in preserved eggs is not to be attributed to the formation of an antitrypsin but, probably, to a changed chemical composition of the albumen in preserved eggs.—*W. Bally.* (Biological Abstracts)

AYRES, JOHN C. *(Agric. Expt. Sta., Ames, Iowa.)* A PROCEDURE FOR THE QUANTITATIVE ESTIMATION OF SALMONELLA IN DRIED EGG PRODUCTS. *Food Technol. 3:* 172-176. 1949.—The dried material is weighed aseptically in 0.1, 1, and 10 g. portions and these

added to tubes or flasks containing 3, 9, and 90 ml. of Selenite-F enrichment broth respectively. Larger or smaller portions can be tested but, when smaller samplings are made, the dry egg product is reconstituted and suitable dilutions added to the enrichment medium. Five tubes are recommended for use at each of the serial dilutions. After the tubes have incubated at 37°C for 16-20 hours, a loopful of the various dilutions of egg product in enrichment broth is streaked on KBG agar and the plates incubated at 37°C for 24 hours. On the KBG agar plates the presence of pinkish-white opalescent colonies surrounded by a bright red area is regarded as a presumptive test for the presence of *Salmonella*. If the colonies produce typical *Salmonella* reactions, most probable numbers data then may be obtained by comparing the number of positive plates at each dilution with the corresponding number in probability tables computed for the same number of replicates. Typical colonies are picked from the plates and transferred to Krumwiede's Triple Sugar or to TSI agar tubes. Assuming that each viable *Salmonella* organism increases in numbers in the enrichment broth, the figures make it possible to use most probable numbers tables for estimating the degree of contamination. Although this is as far as the worker ordinarily would proceed, confirmation and even completion tests can be carried out in the orthodox manner by running urease and SIM tests, fermentation reactions and agglutination tests.—*J. C. Ayres.* (Biological Abstracts)

BERRY, ISABEL, INEZ PRUDENT, and EVA DONELSON WILSON. *(Ohio State U., Columbus.)* FOUR METHODS OF DEFROSTING POULTRY STUDIED. *Jour. Home Econ. 41:* 203-204. 1949.—The study was undertaken to determine differences in tenderness, juiciness, and flavor resulting from commonly accepted methods of defrosting poultry. Fourteen-week-old roasters weighing 3-4 lbs. were frozen at 25°F and stored at 10°F for 1-2 months before cooking. Defrosting methods were: (1) standing in the refrigerator at 40°F; (2) in the room at 77-88°F; and (3) in warm water at 49°C until internal temp. of 4°C was reached for each of the 3 methods; (4) placed immediately in a roasting pan in the oven at 350°F. One half of each roaster was defrosted before cooking; the other defrosted in the oven. The birds were roasted at 350°F to an internal temp. of 85°C. Samples of dark and white meat were scored. There was little difference with respect to flavor and juiciness of the meat among the 4 methods, but the birds defrosted before cooking were more tender than those defrosted in the oven.—*Olive Sheets.* (Biological Abstracts)

CARLIN, FRANCES, BELLE LOWE, and GEORGE F. STEWART. *(Agric. Expt. Sta., Ames, Iowa.)* THE EFFECT OF AGING VERSUS AGING, FREEZING AND THAWING ON THE PALATABILITY OF EVISCERATED POULTRY. *Food Technol. 3:* 156-159. 1949.—Twenty eviscerated roasters and 20 eviscerated fowl were aged for varying periods, then split in two. Forty of the halves were then frozen (20 at 0°F and 20 at -30°F). After aging, or after aging, freezing and thawing, the halves were cooked and rated for palatability using subjective and objective criteria. No differences in aroma or flavor were detected which could be attributed to the various treatments used. Birds which had been aged and frozen showed a tendency to be less juicy than those that had been aged only. Aging appeared to decrease juiciness somewhat also. The tenderness of the birds was markedly affected by treatment. The unfrozen birds tenderized rapidly; high scores were recorded for birds aged 24 hrs. Freezing increased tenderness markedly in those cases where halves had been aged less than 6 hrs. In those cases where they had been aged 24 hrs., there was little difference between frozen and unfrozen halves. The effects of freezing on tenderness observed in this study may be confounded with the effects of thawing since the half carcasses were defrosted rather slowly.—*G. F. Stewart.* (Biological Abstracts)

DAWSON, L. E. and J. A. DAVIDSON. MARKETING EGGS THROUGH A GRADING STATION. *(The Quarterly Bulletin, Michigan State College, 32:* 175, August 1949).

The interior quality of eggs produced has not improved much during this eight year period. However, eggs had been purchased on a quality basis in the area for several years, and a high percentage of eggs were already in the top grades.

Eggs have been coming into the station cleaner than they were 8 years ago. Mechanical egg washers are being used on several farms. Others are washing all or most of their eggs with warm water plus a detergent. Some are probably producing cleaner eggs by using different management practices. Producing clean eggs or cleaning dirty ones is an important economic problem, and certainly deserves further study. (Experiment Station Record)

DEL ROSARIO, J. LEODEGARIO. *(University of the Philippines, College, Laguna).* CAN MALE DUCKS BE CAPONIZED FOR PROFIT? *Philippine Agriculturist 32:* 261-264. 1949.

One hundred fifty ten-week old male ducks were divided into two groups of 75 birds each. One group was caponized and the other was left uncaponized to serve as control. The results showed that with only a little difference in average weight in favor of the capons, 158.0 grams, it is doubtful if caponizing male ducks could be recommended. The caponized male ducks apparently made better use of the feed than the drakes. The average dressing percentage of the caponized ducks was also significantly higher than that of the drakes. Very little advantage, if any, was gained in the quality of the meat of caponized male ducks.—*F. M. Fronda.*

GWIN, JAMES M., GEORGE W. NEWELL, and MORLEY A. JULL. *(U. Maryland, College Park.)* SOME OBSERVATIONS CONCERNING THE PERIOD OF FASTING POULTRY BEFORE SLAUGHTER. *Poultry Sci. 28:* 229-231. 1949.—Withholding feed from birds 24 hrs. before slaughter was found to have little advantage over a 6-hr. period. The additional time caused a loss in body wt. with very little emptying of the intestinal tract. A fasting period of 24 hrs. before slaughter caused a loss of about 2 ounces per bird or 125 lbs. for each 1000 birds. Withholding feed for 3 or 4 hrs. before slaughter appeared to be the most logical and practical procedure.—*Lawrence Morris.* (Biological Abstracts)

HINSHAW, W. R. VETERINARY PROBLEMS IN POULTRY PRODUCTION. *(Veterinary Medicine, XLIV 12:* 519, December, 1949).

According to DR. GEORGE F. STEWART, *(U. S. Egg and Poultry Magazine, 55:* 10 (June, 1949), pasteurization developed during World War II, will soon be generally accepted by egg processors as the means of preparing eggs and egg products for storage.

As a result of experimental work done at Iowa State College and Ohio University, the following temperatures and holding times are recommended in pasteurizing liquid egg products:

Liquid whole egg—142°F. for three minutes.
Liquid yolk—142°F. for two minutes.
Liquid white—134°F. for less than one minute.

These temperatures and times will generally kill more than 99% of all bacteria in egg products and will generally eliminate all coliform and similar organisms. According to Stewart, pasteurization under these conditions will have little or no adverse effect on the culinary properties of egg products. (Experiment Station Record)

HITE, J. P., S. E. KLOXIN, and F. A. KUMMEROW. FAT RANCIDITY IN EVISCERATED POULTRY. IV. THE EFFECT OF VARIATIONS IN DIETARY FAT, ETHANOLAMINE AND CHOLINE ON THE CHARACTERISTICS OF THE FAT EXTRACTED FROM TURKEYS. *Poultry Sci. 28:* 249-253. 1949.—The characteristics of the fat extracted from the tissue of various groups of turkeys which had received a semi-purified ration and supplements of hydrogenated fat, linseed oil, alfalfa leaf meal, choline or ethanolamine were compared. The fat extracted from the skin tissue was found to contain no appreciable amt. of linolenic or arachidonic acid except in samples taken from birds

which had been supplemented with alfalfa leaf meal or linseed oil. The fat extracted from the liver tissue, on the other hand, contained no linolenic and from 5-10% arachidonic acid. Less linolenic and arachidonic acids were found in the fat extracted from groups which had been supplemented with ethanolamine or choline. Furthermore, the induction period of the fat extracted from these groups indicated that it was more stable than the fat from the unsupplemented groups.—*F. A. Kummerow.* (Biological Abstracts)

KAHLENBERG, O. J. *(Nation. Egg Products Assoc., Chicago.)* NOW—A QUICK, RELIABLE GAGE OF YOLK COLOR. *Food Indust. 21:* 467-470. Illus. 1949.—Egg color is measured in an acetone extract of eggs using a photelometer.—*R. S. Harris.* (Biological Abstracts)

KALOYEREAS, S. *(Louisiana State U., University Station.)* FREEZING EGGS IN THE SHELL. *Amer. Egg and Poultry Rev. 10:* 26, 28. 1949.—About 2-3% water was eliminated from the eggs by placing them in a desiccator under vacuum using P_2O_5 as dehydrating agent. Before placing eggs in desiccator they were washed in a 1% HCl soln. for 1 min. and then wiped dry. After desiccation eggs were frozen in a vacuum at 20°F. If they were to be frozen without vacuum, then about 5% moisture should be removed.—*H. G. Lindquist.* (Biological Abstracts)

KALOYEREAS, SOCRATES A. *(Louisiana State U., Baton Rouge.)* A NEW METHOD OF FREEZING EGGS IN THE SHELL AND ITS POSSIBILITIES FOR FURTHER APPLICATION ON FREEZING FOODS IN GENERAL. *Science 109:* 171-173. 1949.—A method of freezing eggs in the shell has been developed by the author. These eggs are suitable for home as well as commercial use. The process consists of removing 2-3% of water from the egg and freezing at 20°F under vacuum. The treatment does not affect the quality of the eggs except to improve the whipping quality of the white. The loss of weight during storage is less than untreated eggs.—*C. D. Sullivan.* (Biological Abstracts)

MAYFIELD, H. L., and E. R. HALBROOK. *(Montana State Coll., Bozeman.)* MEASUREMENT OF EGG YOLK COLOR BY MEANS OF THE COLORIMETER. *Poultry Sci. 28:* 462-464. 1949.—An objective method for the comparative analysis of the color of egg yolk is presented. Egg yolk samples are extracted with acetone (final concn. 89%) and measurements of the optical density of the centrifuged liquid are made on an Evelyn Photoelectric Colorimeter using a 440 mμ filter. These values are compared with the corresponding visual color grade and as the density value increased the visual color grade is also increased.—*Authors.* (Biological Abstracts)

MEHRING, ARNON L. JR., and LOYD L. NESBITT. *(Lime Crest Res. Lab., Newton, N. J.)* A COMPARISON OF LOSS IN WEIGHT OF EGGS HELD IN THREE DIFFERENT ENVIRONMENTS. *Poultry Sci. 28:* 309-310. 1949.—Eggs from 4 strains of New Hampshires were held in a forced-draft incubator, a forced-draft electric oven, and a vacuum desiccator. Significant differences in losses in weights of eggs were obtained among the strains. The effects of the environments of the incubator and electric oven were comparable but that of the desiccator was different.—*A. L. Mehring, Jr.* (Biological Abstracts)

NEFF, A. W., D. B. PARRISH, J. S. HUGHES, and L. F. PAYNE. *(Agric. Expt. Sta., Manhattan, Kans.)* THE STATE OF VITAMIN A IN EGGS. *Arch. Biochem. 21:* 315-320. 1949.—Small samples of yolk were obtained by taking aliquots of an emulsion of yolk and salt soln. Vit. A was extracted using Skellysolve B. Alcoholic and esterified vit. A were separated on activated alumina, and the esterified form was eluted using 4% acetone in Skellysolve B. Solvents were evaporated, the lipide residue was saponified and vit. A extracted with ethyl ether. Vit. A was extracted from another aliquot of the same emulsion, and after removal of solvents, the lipide residue was saponified and vit. A re-extracted. Vit. A was detd. on both samples by the Carr-Price reaction and content of alcoholic

vit. A found by difference. All eggs were from hens fed a low-carotenoid ration with addition of 1500 I.U. vit. A/lb. or the same basal ration plus 1000 or 5000 I.U. of vit. A alcohol, vit. A ester or carotene given daily by capsule. 71-93% of the vit. A in yolks was the alcoholic form regardless of the form or levels fed. Percentage of vit. A occurring as the alcohol decreased when high levels of vit. A ester or carotene were given.—*D. B. Parrish.* (Biological Abstracts)

PAYNE, LOYAL F. *(Kansas State Coll., Manhattan.)* CAPON PRODUCTION. *Bull. Kansas Agric. Expt. Sta. 335.* 1.43-Illus. 1949.—Reference is made to caponizing 10- to 14-day old cockerels as well as those which weigh 0.75-1.5 lbs. The identification of sex, length of starvation period, and necessary tools are given for performing the operation, which is described in detail, with 20 illustrations. A possible explanation is suggested for "wind puffs" and "slips." The hormone diethylstilbestrol was used to produce feminizing effects in cockerels and cocks. R. I. Red capons averaged 8 lbs. each at 8 mos. of age on 51.33 lbs. of feed. There was no significant difference in the wt. of cockerels and capons at 32 weeks of age as quoted from a Canadian worker. Capons brought more per lb. on the market than roasters and turkey hens. Nothing was gained by caponizing turkeys and guineas. The bulletin concludes with a brief history of capon production, starting with Cato and Varro (37 B. C.).—*Author.* (Biological Abstracts)

PETERSEN, CHARLIE F., and C. E. LAMPMAN. *(Agric. Expt. Sta., Moscow, Idaho.)* RELATIONSHIP OF EGG SIZE DURING FIRST YEAR PRODUCTION TO PERCENTAGE INCREASE IN SECOND YEAR. *Poultry Sci. 28:* 302-305. 1949.—Information obtained by early investigators studying egg wt. or egg size shows that, in general, hens produce eggs of max. size during the 2d yr. of production. The % increase in egg wt. during the 2d yr. varies from 7 to 9% greater than max. 1st yr. egg wt. More complete data obtained from 576 hens over a period of 4 yrs. have been accumulated at this Station. Hens that produced small eggs (22 to 24 oz./doz.) during their 1st yr. of production also produced relatively smaller eggs the 2d yr. when compared with hens laying eggs larger than standard size. However, the percentage increase of egg size from yr. 1 to yr. 2 was considerably greater for the hens producing the smaller eggs. When the 1st yr. egg size was less than 25 oz./doz., the % increase during the 2d yr. was from 8 to 11. First yr. egg size larger than 25 oz./doz. resulted in 2d yr. increases of only 2 to 6%. The avg. 2d yr. increase in egg size for the 576 hens of 7.6% was in close agreement with the earlier information available.—*Authors.* (Biological Abstracts)

POLLAK, FREDERICK F. METHOD OF RECOVERING ALBUMIN ADHERING TO EGG SHELLS. *U. S. Patent* 2,451,116. Appln. March 8, 1947. Issd. Oct. 12, 1948.—Egg shells are leached with water, the soln. extracted with 3 to 25% terpineol, the yolk and yolk oil dissolving in the terpineol which is separated from the aqueous albumin soln. by decantation. (Biological Abstracts)

ROMANOFF, ALEXIS L. *(Cornell Univ., Ithaca, N. Y.)* EVALUATION OF FUTURE PERISHABILITY OF INTACT FRESH EGGS BY RADIO-FREQUENCY CONDUCTIVITY. *Food Research, 14:* 310, July-August, 1949.

New-laid eggs differ greatly in radio-frequency conductivity. It is suggested that differences in conductivity are related to differences in internal quality.

Eggs laid by the same hen are of fairly similar conductivity.

Conductivity increases as time passes, at a rate directly related to the original conductivity of the egg. (Experiment Station Record)

VAN NESS, GLENN. *(U. Florida, Gainesville.)* OFF-COLOR EGGS. *Poultry Sci. 28:* 149-150. 1 fig. 1949.—Off-color egg shells are encountered in pullet disease-bluecomb outbreaks. Their occurrence under exptl. conditions might indicate a relationship offering an understanding

and a solution to the disease problem. Calcium overlay on a pigmented egg is due to retention in the oviduct. Leghorn eggs show roughness and blobs of $CaCo_3$. Non-pigmentation is indicative of a more adverse effect not clearly understood. It is believed to be due to the need or the act of eliminating sodium phosphate through the kidneys to provide Ca for shell formation. An endocrine mineral metabolism relationship is to be considered. Non-pigmentation in Newcastle disease is not to be confused, and both diseases must be considered in making a diagnosis.—*Glenn Van Ness.* (Biological Abstracts)

WINTER, A. R., and O. J. COTTERILL. *(Ohio State U., Columbus.)* THE PRESERVATION OF SHELL EGG QUALITY BY OIL DIPPING RIGHT ON THE FARM. *Amer. Egg and Poultry Rev. 10:* 14-16, 19. 1949.—The oil recommended is a paraffin base, colorless U.S.P. mineral oil having a viscosity of 50-80 Saybolt sec. at 100°F, pour point at 25-35°F with specific gravity 0.825-0.845 and especially prepared for shell treating eggs. Only clean, dry, cool eggs with sound shells are to be dipped in oil for 5 sec. preferably 4-24 hrs. after gathering and cooling. The temp. of oil may be 55-70°F. The eggs are allowed to drain 4-24 hrs. before packaging. If eggs get broken in the oil the oil should be heated to 180°F for 15-30 min. and then strained through a strainer. When oil gets colored or has developed an odor or has an accumulated sediment, it should be replaced. Oil-treated eggs gave equal or better scores than unoiled in palatability, custard, poaching properties and angel cake.—*H. G. Lindquist.* (Biological Abstracts)

MANAGEMENT

BAROTT, H. G., and EMMA M. PRINGLE. EFFECT OF ENVIRONMENT ON GROWTH AND FEED AND WATER CONSUMPTION OF CHICKENS. II. THE EFFECT OF TEMPERATURE AND HUMIDITY OF ENVIRONMENT DURING THE FIRST EIGHTEEN DAYS AFTER HATCH. *Jour. Nutrition 37:* 153-161. 1949.—Chickens were housed in a controlled environment without a hover for the 1st 18 days after hatch, to determine the opt. temp. and humidity for growth and efficiency of feed utilization. 53 temp. expts. were performed, using 30 chickens in each expt. Temp. the first 9 days was 94°-95°F at the start and dropped uniformly to 87°-88°F on the 9th day. From the 9th to 18th days the temp. was varied with different lots of chickens, ranging from 86°-70°F on the 18th day. Conditions other than temp. were the same in all expts. Max. growth and efficiency of feed utilization from the 9th to the 18th day was found when the temp. was dropped uniformly from 87°F on the 9th day to 80°F on the 18th day. The growth under these conditions equalled a 130% increase in wt. over the wt. on the 9th day. Efficiency of feed utilization rose from 0.43 on the 9th day to 0.49 on the 18th day. Both growth and efficiency became less as the temp. was varied either way from the range found opt. for max. growth. 37 expts. were conducted with relative humidities ranging from 35 to 75%. Little or no difference in growth was noted.—*Auth.* (courtesy Wistar Bibl. Serv.).

BAROTT, H. G., and EMMA M. PRINGLE. *(U. S. Dept. Agric., Beltsville, Md.)* EFFECT OF VARIOUS TYPES OF BROODING ON GROWTH AND FEED CONSUMPTION OF CHICKENS DURING THE FIRST 18 DAYS AFTER HATCH. *Poultry Sci. 28:* 450-456. Illus. 1949.—Comparative expts. were conducted with chickens from hatch to 18 days of age using 3 distinct types of brooding: houses with uniform environment, commercial brooders with hovers, and a room containing a hover. The temp. in the house with uniform environment and under the hovers was 94°F at the start and reduced uniformly to 80°F on the 18th day. The temp. outside the hovers was 75°F. The chickens in the uniform environment showed the best gain in wt. and the greatest efficiency of feed utilization. The chickens in the room with a hover made the poorest growth.—*Authors.* (Biological Abstracts)

DOSSIN, CARL O. SIX MISTAKES THAT CAN CAUSE *WET LITTER*. *Poultry Tribune, 55:* 7, September, 1949.—*The Six Errors!* (1.) Faulty Drinking Fountain. (2.) Too Many Chickens. (3.) Irregular Feeding Time. (4.) Improper Ventilation. (5.) Inadequate Insulation. (6.) Poor Litter Management. (Experiment Station Record)

ELEY, C. P., and EDMUND HOFFMANN. *(U. Georgia, Athens.)* FEED PARTICLE SIZE AS A FACTOR IN WATER CONSUMPTION AND ELIMINATION. *Poultry Sci. 28:* 215-222. Illus. 1949.—Results of several trials are summarized in this report, along with comments of related work. The authors conclude that size of feed particles has no effect on moisture content of droppings, water or feed consumption or wt. gains. The water consumption varied with the age of the birds and season of the yr. There was a loss of 20 lbs. of feed per yr. per 100 hens in the drinking water in the finely ground feed. The coarser the grind the less the waste through this source.*Lawrence Morris.* (Biological Abstracts)

FUNK, E. M., and JAMES F. FORWARD. *(Agric. Expt. Sta., Columbia, Mo.)* EFFECT OF WASHING SOILED EGGS ON HATCHABILITY. *Poultry Sci. 28:* 155-157. 1949.—1215 eggs collected from a flock of new Hampshires from Jan. 21 to Aug. 3, 1948, cleaned by washing in a 0.38% Roccal (10%) soln. which was 10°-15°F warmer than the eggs, hatched 69.1% as compared with 69.9% for 18,081 naturally clean eggs.—*Authors.* (Biological Abstracts)

HARPER, J. A. *(Agric. Expt. Sta., Corvallis, Ore.)* THE RATE OF RESPONSE OF TURKEY HENS TO ARTIFICIAL LIGHT AS RELATED TO REPRODUCTION. *Poultry Sci. 28:* 312-314. 1949.—Data presented from a trapnested flock of 146 Broad Breasted Bronze turkey hens shows rate of response of turkey hens to artificial light is directly related to seasonal egg production. Individual hens responding most rapidly to artificial light stimulus produced the largest number of eggs during the season. Slower response was marked by decreasing seasonal production with differences in egg production much greater than the time intervals of response. The % of individual turkey hens in each group showing broody or non-broody pauses decreased as the interval of response to light increased. These observations suggest the possibility of improving egg and poult production in turkeys by saving stock from individual hens showing most rapid response to light stimulation. Date of sexual maturity may be detd. without trapnesting by examination of the posterior end of the oviduct to observe when the vaginal membrane is perforated.—*J. A. Harper.* (Biological Abstracts)

TEMPERTON, H., and F. J. DUDLEY. *(Nation. Inst. Poultry Husbandry, Shropshire, Eng.)* A STUDY OF SOME CURRENT PROBLEMS CONNECTED WITH THE HOUSING OF LAYERS IN INDIVIDUAL BATTERY CAGES. *Harper Adams Utility Poultry Jour. 33:* 17-29. 1948.—Three hatches of pullets were divided and housed in laying pens with access to grass runs and in laying batteries. At the end of 48 weeks the remaining layers in each housing group were subdivided in 2 groups; one of these remained as in the 1st yr. and the other of each housing group was reversed. Mortality was not affected by either type of housing within either the 1st or 2d yrs. There was a higher percentage of mortality in the 2d yr. among the birds confined in the battery in the 1st yr. than in those kept in the laying house that yr. In 2 of 3 hatches the battery birds laid more eggs than those in the laying pens in the 1st yr. Types of housing in the 2d yr. had no effect on egg production in that yr. Those birds in the laying pens in the 1st yr. laid better than the battery birds in the 2d yr., whether housed in pens or in batteries. The avg. egg wt. of the battery birds was higher than that of those in the laying pens in both yrs. The type of housing had no marked effect on body wt. The ratio of feed consumed to eggs produced was similar for both groups. The wt. of feathers was greater in the 2d yr. for those in the laying pens. Type of housing had no effect on the dressed wt., liver wt. or heart wt. The birds in the laying pens had gizzards weighing 6 and 13% more than those in the batteries in the 1st and 2d yrs., respectively.—*T. B. Clark.* (Biological Abstracts)

SMALL POULTRY FLOCKS CAN BE EFFICIENT TOO. *(Iowa Farm Science,* Vol. 4, No. 4, October, 1949, page 5-53, Iowa State College, Ames Iowa.

It's management not the size of the flock, that makes the most difference in the returns you can get from your poultry.

In Minnesota, only about 6 percent of poultry flocks contain as many as 400 chickens. The remaining flocks are nearly equally divided between flocks of under 100, from 100-200, and from 200-300.

Records kept by the Southeastern and Southwestern Minnesota Farm Management Services show that hens in large flocks don't lay many more eggs per hen than hens in smaller flocks. (Experiment Station Record)

GENERAL

BYWATERS, J. H. *(Agric. Expt. Sta., Blacksburg, Va.)* RECENT RESEARCH IN TURKEYS. *Amer. Egg and Poultry Rev. 9:* 64-68. 1948.—A summary of some research work on nutrition, vitamins and drugs is given together with some work in genetics. Miscellaneous topics on the time and place of fertilization of the hen's ovum and the peck order in hens are reviewed.—*H. G. Lindquist.* (Biological Abstracts)

DE BEER, J. A. CENTRAL LAYING COMPETITION. *Farming in South Africa 24:* 279, 298-302. 1949.

A summary is given of the results obtained at the 23rd Open Test and the 15th Breeders Register Test conducted at the Glen College of Agriculture, Orange Free State. The highest producing White Leghorn in the light breed division laid 299A and 1 C grade and the highest Black Australorp in the heavy breed division laid 295A and 3B grade eggs in 336 days. 12 out of 17 hens retained at the test for 365 days laid 300 or more A-grade eggs. The mortality in the Open Test was 14.1 per cent and in the Breeders Register Test 13.2 per cent.—*A. M. Gericke.*

FRONDA, F. M. and PONCE BLAS H. INFANTE. RELATION IN DUCKS BETWEEN DURATION OF INCUBATION AND SEX. *The Philippine Agriculturist,* Vol. XXXII, Oct.-Nov.-Dec., 1948, No. 2, page 165.

The ratio of males to females among the ducklings observed in this experiment was 50.39 percent males to 49.61 percent females, a close fit to a 50:50 ratio.

The sequence of hatches of four-hour periods showed that the females occurred significantly in excess in the first two lots, males in the last two lots, and neither sex in the two middle lots. This trend was likewise observed in the sequence of the eight-hour periods of hatching. The females predominated very significantly during the first eight hours of hatch; neither sex predominated in the next eight hours; and males predominated during the last eight hours. (Experiment Station Record)

FUNK, E. M., and JAMES F. FORWARD. *(U. Missouri, Columbia.)* THE RELATIONSHIP OF EGG SHELL COLOR TO HATCHABILITY IN NEW HAMPSHIRES. *Poultry Sci. 28:* 577-580. 1949.—Eggs laid by New Hampshires, when classified as dark brown, medium brown and light brown, hatched as follows: percentage hatch of all eggs 74.1, 70 and 55, respectively. Light brown eggs were less fertile during the summer and embryonic mortality was higher in light brown eggs throughout the exptl. period. (Jan. to Aug.).—*E. M. Funk.* (Biological Abstracts)

JULL, M. A. *(U. Maryland, College Park.)* MARYLAND'S RESEARCH RESUME FOR ITS BIG POULTRY INDUSTRY. *Amer. Egg and Poultry Rev. 9:* 46, 48 ,50. 1948.—This article gives a brief summary of observations and results of expts. made at the Md. Agric. Expt. Sta. Breeding results obtained indicated fast-feathering strains of New Hampshires and Barred Plymouth Rocks grew faster than slow-feathering strains and there were fewer pinfeathers when dressed for market.

The feeding of mash containing 0.2% added thiouracil and thyroproteins gave the following results: Thiouracil decreased rate of growth but improved market grade; adding 1 to 3 g. thyroprotein to 100 lbs. of mash containing the 0.2% thiouracil gave equal or better growth than the plain mash but a slightly lower grade than those fed thiouracil but superior to those fed plain mash. Growth rate of chickens was decreased when they were fed a diet deficient in pyridoxine but containing 4% of the amino acid glycine. Storage of dressed chickens is briefly described as is the cooling and refrigeration of eggs.—*H. G. Lindquist.* (Biological Abstracts)

JULL, MORLEY A. *(U. Maryland, College Park.)* MORE EFFECTIVE TEACHING PROGRAM. *Poultry Sci. 28:* 236-239. 1949.—Data pertaining to the relative importance of the poultry industry in 1945 as a branch of agriculture are presented. For the U. S., the poultry industry contributed 14% of the total gross farm income. By states, the gross income from poultry as a percentage of total gross farm income varied from 76.27 to 3.85. With respect to the relative importance of the poultry industry in several states, poultry depts. appear to be greatly understaffed as compared with other major depts.—*M. A. Jull.* (Biological Abstracts)

SERFONTEIN, P. J., and C. L. MARAIS. THE REARING OF CHICKENS. I. THE PURCHASE OF DAY-OLD CHICKS. *Farming in South Africa 24:* 281: 375-378 and 382. 1949.

The success of poultry farming depends largely upon the quality of chicks produced. Various factors are discussed which must be taken into consideration when day-old chicks are purchased.—*A. M. Gericke.*

THORBURN, J. B. HOME-MADE POULTRY HOUSING. *Agriculture, The Journal of the Ministry of Agriculture,* (England) LVI: 278, September 1949.

Although a solid floor is ideal, one can be made of slats upon which the birds will roost, or it can be omitted altogether if perches are fitted. Wire netting fastened across the bottom of the house will safeguard the hens against foxes.

For proper comfort each hen requires nine inches of perch space or one square foot of slatted floor. It is advisable to give them as much space as possible, because overcrowding will reduce egg production. A slatted-floor house to hold 50 hens ought to be about 8 feet x 6 feet; if perches are used, rather bigger. (Experiment Station Record)

Note:

The Experiment Station Record, published by the Office of Experiment Stations, United States Department of Agriculture, was discontinued as a publication several years ago. References to "Experiment Station Record" in some of the items of this abstract material, therefore, refer not to the publication of this name but to the records kept by the Office of Experiment Stations.

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Receipts		
Memberships	1,341.00	415-11 0
Advertising (Journal)	1,069.35	———
Subscriptions (Journal)	235.00	———
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Miscellaneous	———	16-7- 9
TOTAL	$3,760.66	£1200-13-11
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Printing (Journal)	$2,079.08	
Editor (Journal)	400.00	
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Postage	317.50	7- 8- 8
Biological Abstracts	28.00	
Supplies (Forms, paper, envelopes, etc.)	88.25	6-16- 0
Clerical	600.00	
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W. P. C. Reports	17.63	
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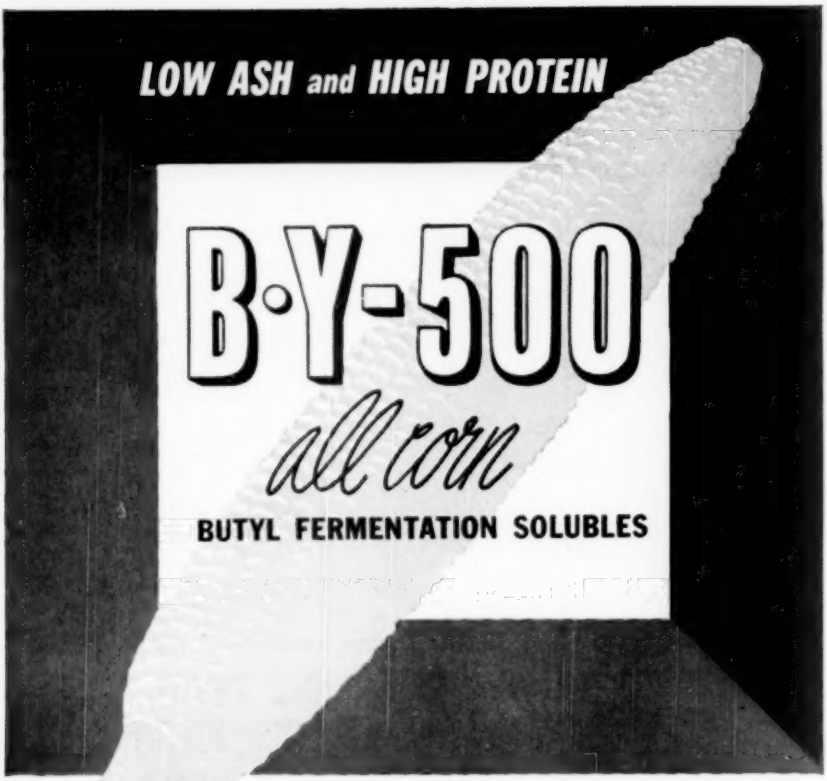

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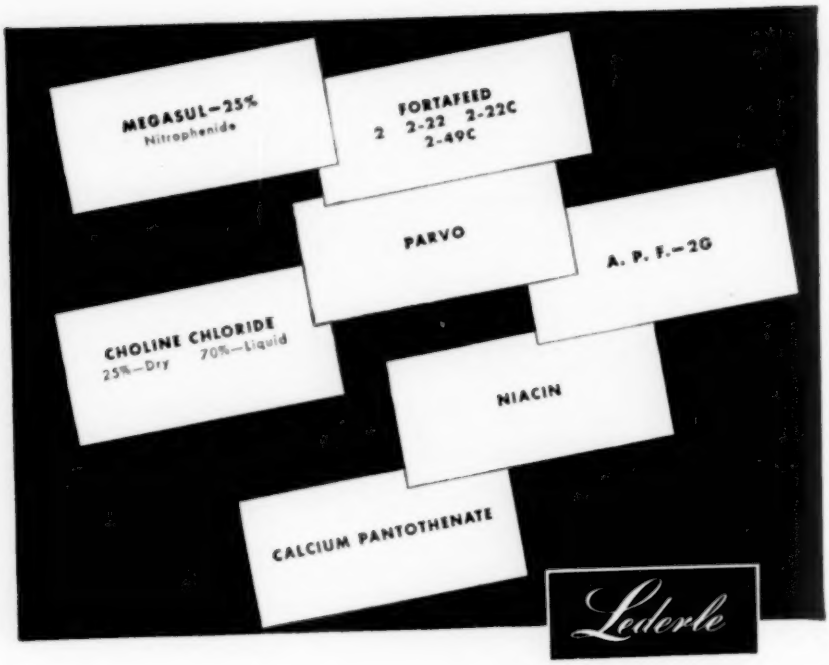

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